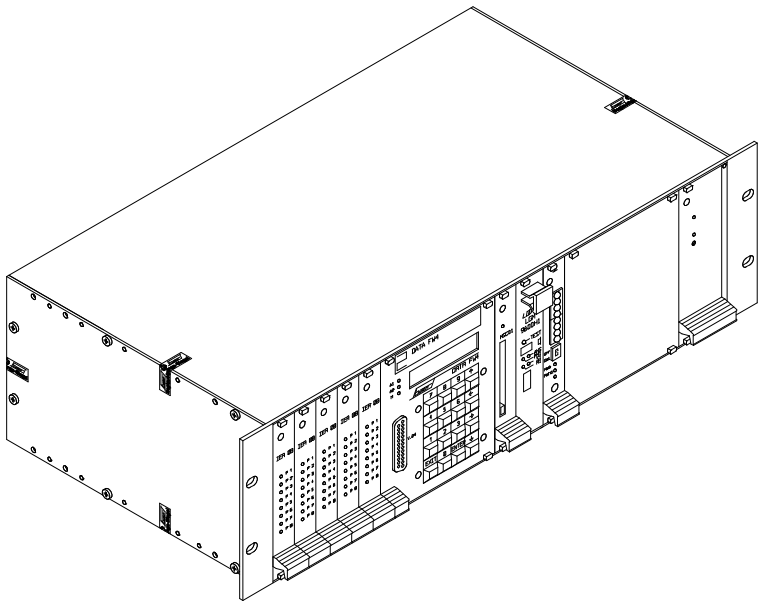
DataFW4 / DATAREG

Data logger

User Manual | Doc.-No: E122209209002



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Printed in Germany

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1 General Information

The DataFW4 / DATAREG family was designed as a powerful device for the registration and processing of electrical impulses from energy meters, flow meters, heat flow processors and similar devices. It is meant for installation in bulk energy supply points, power station injection points, at special contract customers and industrial premises. Load profiles, calculated values and spontaneous events are processed and stored on the site. This data can be interrogated by hierarchically higher processing devices via a number of interfaces.

1.1 Performance features

- Setting parameter values via the service interface of your PC
- Keyboard operation (menu driven)
- Processing of analogue and digital measured values
- Pulse inputs, 48 maximum
- Logical inputs, 4 maximum
- Eight summation registers (in one energy direction), or 8 summation balance registers
- Measuring period output:
  - Switched by radio-controlled clock, fixed measuring period (15 minutes) - other periods available on request
  - Switched by DataFW4, freely selectable measuring periods (1 min. to 1 hour)
- Pulse outputs, 8 maximum
- Data capture of energy and maximum tariffs
- Maximum inhibit and reset
- Store data of the last 12 resets
- Marking of measured values
- Built-in real time clock, active when radio-controlled clock fails or when DataFW4 has no radio-controlled clock.
- Built-in radio-controlled clock DCF77 with tariff calendar, fixed program (option)
- Tariff calendar (freely programmable)
- Automatic switch to summer and winter time, or standard time
- Parameterization switching times as desired over 5 years
- Freely selectable measuring periods in DataFW4 (1 min. to 1 hour), standard 15 min.
- Recording power failures
- Battery backed data saving in case of power failure (exchangeable, data storage 10 years)
- Protection against unauthorized manipulation through separate passwords for setting parameters, maximum-reset, change of data carrier and system restart
- Saving measured values (depending on equipment specification) in a ring memory (7 to 35 days), external printer or direct transmission from your PC via modem or RS232 interface.
- The language used for operating can be selected (English, German, French, Dutch/Flemish, Polish)
- Load check (30 sec. or 1 min.)
- Heat meter reading (option)

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1.2 System overview

The DataFW4 is a modular built telecounting instrument intended for use in the electricity, gas and water supply industries. It processes, evaluates, displays and records the pulses received from energy meters. The received pulses are used to calculate e.g. the demand values that are saved in the measured value memories (periodic buffers) at the end of every measuring period. At the same time the corresponding energy values are cumulated in separate registers. The local equipment usually works together with a remote metering central station that periodically reads the stored demand values via remote interrogation and evaluates them.

The DataFW4, in its minimal configuration, consists of the following components:

1.2.1 The central processing unit (CPU1):

- Processor: TMP 68301
- RAM: 256kByte
- ROM: 512kByte
- Data backup: Lithium battery
- receives pulses and converts them into the corresponding demand or energy unit (for example kW, kWh, kvar)
- sends the results of this conversion to the memory and communication unit
- calculates and stores the demand maxima (value and time)
- summates the received pulses
- sends the summation results to the pulse outputs
- does special calculations, for example power factor cos(phi) for individual inputs and sums
- manages time, for example automatic switch over from winter time to summer time, tariff calendar etc
- interrogates the control inputs and sets the control outputs
- communicates with the user via the keyboard, the LCD-display or the service interface
- controls the external printer (option)

1.2.2 The recording and communication unit (CPU2):

Three variants are available. All of them can store the demand values into two periodic buffers and transmit the contents of the periodic buffers, by means of a serial interface or a MODEM, to a remote metering central station using a high security “Serial Code Telemetering (SCTM)” protocol.

The events (for example register overflow, the change of important system parameters, etc) and the time when they appear are saved in a buffer for events (spontaneous buffer).

Details of each variant:

- **Memory card recording module (MSC01)**
  In addition to the internal periodic buffers this rack-mounted module has a plug-in slot for a memory card to the PCMCIA/JEIDA Standard. The contents of the periodic and spontaneous buffers as well as some of the device parameters are stored a second time on the memory card. The memory card can be read by any PC via a commercially available reader unit.
- **Recording unit (DS01)**
  This unit has no external recording medium but it has two internal RS232 serial interfaces that permits a local communication with a program that evaluates the data saved in the internal buffers.
- **Recording unit with a RS232 serial interface (VU25/VU26)**
  This unit has no external recording medium but it has a VRS232 serial interface that permits a local communication with a program that evaluates the data saved in the internal buffers.

You can get some more information about these four variants of recording and communication units in the corresponding chapters in the main part of these operating instructions.

1.2.3 Pulse and control input cards (IEA08)

These cards convert the pulse forms, respectively the voltage levels, that are used in remote metering, (e.g. momentary: IEW, S0: IES, bipolar current pulses: IED) into the TTL levels that are used by the CPU:

- max. 48 pulse inputs (IEW, IES, IED)
- max. 7 control inputs (IES)
- max. 4 logical inputs (IES)

1.2.4 Pulse and control output cards (IEA08)

These cards convert from TTL-levels into the voltage levels that are used in remote metering:

- max. 8 outputs (IAW)

1.2.5 Power supply unit

Power supply units with different auxiliary voltages are available for different versions of the equipment and user-specific requirements. If desired, a no-break power supply can be supplied.

- 110/230-240VAC
- 60VDC or 110VD or another (option)

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The following devices are also available on request:

1.2.6 Communication unit

The interface module for data interrogation is the connection between the internal modem interface of the main memory and communication module and the remote metering centre. DataFW4 provides 3 solutions for this:

- Data teletransmission by fully automated slot-in modem.
- Direct data output via the RS232 interface of the MODA02 interface card
- M-Bus adapter card.
- Fabre glass

The following protocols are available for communication:

- SCTM protocol
- LSV1 procedure
- IEC 870-5-102

1.2.7 Radio clock (DCF77 / GPS)

The radio clock receives time signals from the DCF77 transmitter in Frankfurt and then sets the internal time.

Optional is a GPS receiver possible.

1.2.8 Analogue signal current input cards (IF8120)

These cards convert the analogue signal (0..20mA or 4..20mA) into the TTL levels that are used by the CPU.

1.2.9 CENTRONICS interface for external printer

Instead of a built-in printer it is possible to use a CENTRONICS interface in order to connect an external printer (compatible with EPSON FX-80; ASCII format).

1.2.10 RS232 interface for load check

As an option DataFW4 can be equipped with additional RS232 interface for 30sec/1min load check:

- The 30sec load check is a scan of the instantaneous values of the summation registers (maximum demand) according to DIN 19244, Part 52.
- The 1min load check is a scan of the instantaneous values of the summation registers (energy) according to IEC 60870-5-102.

The station address, baud rate and number of values to be transmitted is set in the parameterization software DMFPARA. See the separate description of DMFPARA for further details.

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1.3 Block diagram DataFW4

The block diagram of the modules listed in Section 1.2:

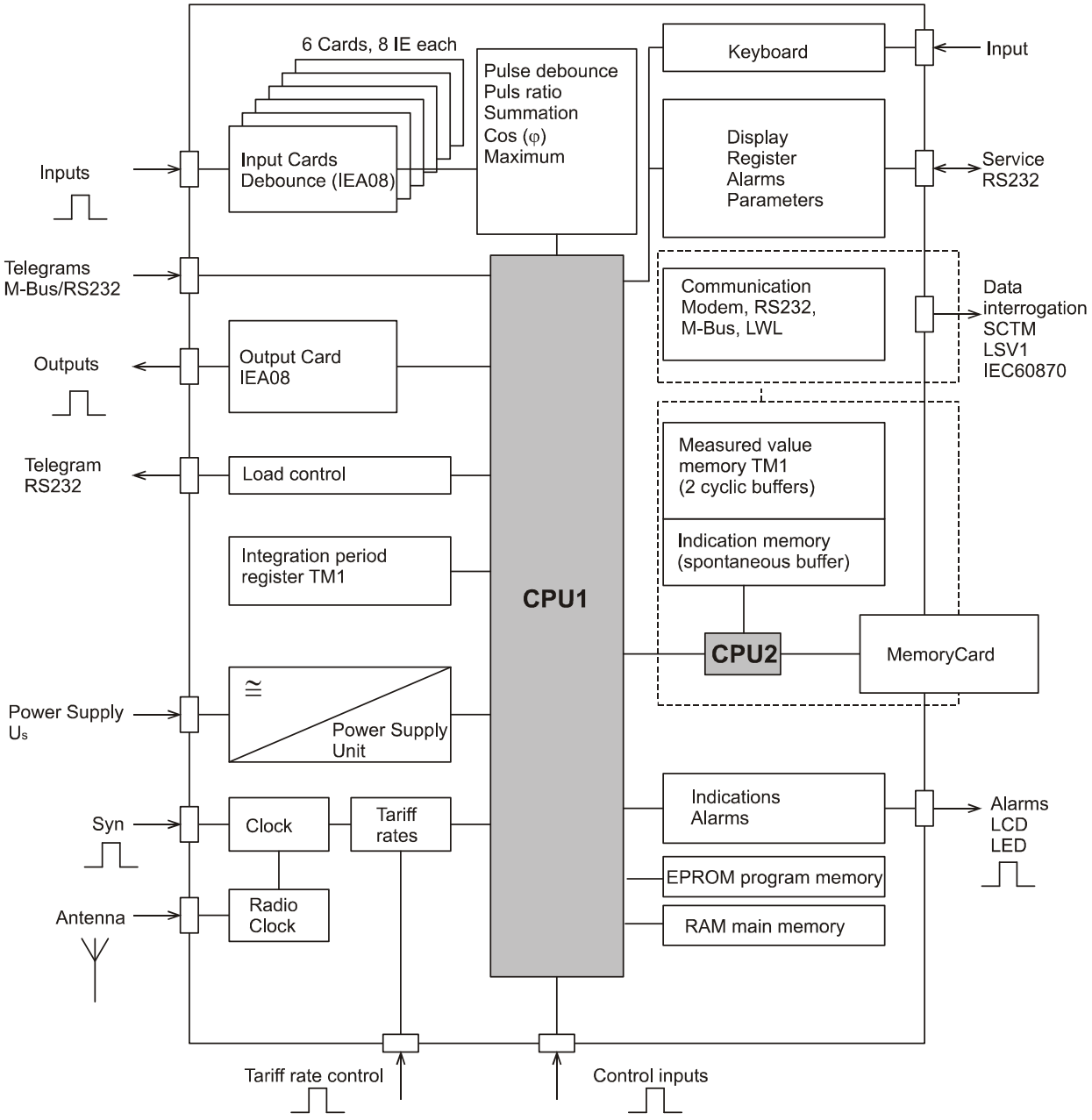

Figure 1, Block diagram DataFW4

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1.4 Software

- Manages a max. of 48 meter inputs (depends on order)
- Manages a max. of 4 logical inputs
- Manages a max. of 7 control inputs (synchronization, marking of measured values, maximum inhibit, 2 tariff signal inputs, external reset signal)
- Manages a max. of 8 outputs (e.g. measuring period output, summation registers 1-8) with standard pulses or static signals
- Interrogation of all flagged error conditions
- Reads all registers of a meter
- Setting device parameters via a password (max. 8 digits)
- Interruption of measurements and call-up of changeover times via a password
- Entry of all meter parameters
- Entry of a freely selectable starting time
- Saving all data in case of power failure
- Calculation and check of all important data after power failure
- Data errors are marked and saved
- Power failure message
- Synchronization of real time clock, also by radio-controlled clock
- Communication with external printer
- Communication with Memory Card reader module MSC01 or recording unit DS01/VU25/VU26
- Communication with external printer (option)
- Communication with V.24 interface for load check (option)
- Communication with heat meter (option)

1.5 System

1.5.1 Parameterization

The DataFW4 must only be parameterized while measurement is not being performed. Some settings are disabled while measurement is running, others can be performed but cause problems for the evaluation of data obtained during this integration period.

Complex functions such as tariff rate calendar, summer/winter time switchover, printer texts and power factor can only be parameterized using the DMFPARA parameterization software.

The PARAMETERIZATION menu is password-protected. However, if no password has been installed, you can skip the prompt for the password by pressing the ENTER key again. If a password is installed and is entered incorrectly you return to the menu item PARAMETERIZATION automatically and can call up the function again.

To parameterize the DataFW4 connect a PC, in which the DMFPARA parameterization software has been installed, via the RS232 service interface on the front panel of the CPU. DataFW4 can only be comprehensively parameterized using this software. Please refer to the operating instructions of the parameterization software supplied. Complete parameterization via the keypad is not possible. The manufacturer accepts no responsibility for correct parameterization.

The following functions and values can be parameterized in the DataFW4:

- Input/output signal matching
- Control inputs
- Internal tariff program
- Calendar and switching time data
- Assignment of the cyclic buffers (integration period memory)
- Integration period duration
- Number of sums
- Summation or summation balance calculation
- Special evaluation (e.g. cos(φ))
- Interface for data scan
- Printer outputs

1.5.2 Inbuilt Self-Test

- RAM Test: the DataFW4 memory is continuously checked (over 100 times within 24 hours). If a defective storage position is located, an error message will be displayed and the error signal relay activated. The error message is available via remote interrogation.
- EPROM Test: the contents of DataFW4's EPROM (CPU1 and CPU2) are continuously checked (more that 10,000 times within 24 hours). If an imbalance is detected between the computed check sum and the saved check sum, an error message will appear in the display and the error signal relay activated. The error message is available via remote interrogation.

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1.6 Metered value processing

1.6.1 Pulse inputs

The pulse and control inputs must have a minimum duration, which is programmable („debouncing“) in order to be recognized. If their duration is less than this minimum value they will not be recorded. For the pulse inputs you may choose the duration of the pulse separately from the duration of the interval, between 10ms and 2000ms in steps of 10ms. For the control pulses the minimum duration of the pulses and of the intervals is fixed at 30ms minimum. The pulse inputs can also detect pulses that are too long. Such pulses will not be counted. Pulse monitoring may be programmed within the range from 10ms to 2000ms. It is switched off after a system restart, i.e. the pulse lengths can be of any duration.

For activation of the inputs see the mark “#” in menu “Info Inputs / Counter Value”.

! Only the first 32 inputs will be saved in to the periodic buffers.

1.6.2 Energy and demand registers

The incoming pulses are separately counted for energy and for maximum demand. They are multiplied by the pulse scaling value (between 0 and 99999999/99999999) (only positive values) and cumulated in the energy registers and demand registers separately for each tariff (see block diagram).

In the present equipment software status the number of decades of the energy registers is set at 8 and that of the demand registers at 4. When an energy register has reached the value 99999999 it will continue with 00000000. At the same time an error flag is set in the equipment status register.

The maximum demand registers react differently. They remain at 9999 until the end of the measuring period, when the demand registers are always set to 0000. When an overflow of the demand registers occurs an error flag is also set. These error flags can be reset only by hand or by means of the service interface.

The demand registers commence counting only after measurement has started.

1.6.3 Summation

The metering pulses fed into the inputs are scaled and can be added in up to 8 different summators. The input scaling may be chosen between -99999999 and 99999999. Negative scaling only makes sense for import/export calculations. It simply summating the negative results are not recorded in the result registers. After the summation, the intermediate results are divided by a programmed common denominator and saved in the energy or max. demand summation registers. The energy sums also can be scaled with a separate denominator and fed to the pulse outputs.

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1.6.4 Import/export calculations (summation balance)

When the energy flows into two directions (import/export), it is necessary to record both directions separately. This is the reason for the import/export calculation. The inputs metered in the positive direction (import) are scaled positively, whilst the remainder (export) are scaled negatively. The positive values are separated from the negative values, separately registered or fed to separate pulse outputs.

! While summation balance calculation is active only the first 4 summation balances can be stored in the cyclic buffers.

1.6.5 Hysteresis

The hysteresis (free-wheeling) is used only in energy summators and is active only during import/export calculations. It processes only the metered values that are fed to the pulse outputs. It has the function of a temporary buffer. Every pulse with a „positive“ sign causes the contents of the free-wheeling circuit to increase and every pulse with a „negative“ sign causes it to decrease. Pulses will appear at the output of the free-wheeling circuit only when its programmed capacity is exceeded or the value is negative. A built-in energy direction switch switches the impulses to the positive or negative output. The purpose of the free-wheeling circuit is to prevent a rapid succession of pulses at the „positive“ or „negative“ outputs when the energy flows of import and export are roughly in balance. A sensible guide value for the capacity of the free wheeling circuit is twice the sum of the absolute values of all scalings of the summator in question.

1.6.6 Pulse outputs

DataFW4 can output summated pulses directly and locally.

As in the case of the pulse inputs, the duration of the pulses and of the intervals of the pulse outputs may be set between 10ms and 1000ms in steps of 10 ms. A pulse output can temporarily store up to 1000 pulses. When this value is exceeded, an error flag in the equipment status is set. This flag can be reset only manually by the user or via the service interface. It is possible, by means of the software to assign a pulse output to a specific summator. When this assignment is changed, the intermediate pulse memory is cleared.

1.6.7 Maximum demand calculation

When the measuring has been started, the DataFW4 will compare the maximum demand value at the end of every measuring period with the largest value measured to date. If the new value is larger, then it will be stored together with date and time when it occurred.

1.6.8 Maximum demand reset

At the maximum demand reset all measured maximum values will be copied into the historical list memory and the MD unit set to zero to enable a new maximum calculation. The reset can be initiated in three ways:

- Via the control input RSTX.
- Time-controlled monthly, daily or once an hour. The exact time can be programmed.
- Manually on keyboard (secured by password)

All three modes can be separately enabled or disabled.

1.6.9 Historical MD values

The DataFW4 stores at every max. reset the following values in the historical list memory:

- Energy values since last reset
- Maximum demand values with date and time
- Lowest average cos(phi) value since last reset

These values are stored in the CPU and can be read out on the display only. If required they can be printed. The DataFW4 stores the previous 12 maximum values.

1.6.10 Power factor cos(φ)

The DataFW4 can compute the power factor cos(phi) of any input or summation registers. Any register can be defined as being active or reactive. Up to four cos(phi) calculations are possible. The instrument computes the average power factor over one Tm as well as the average over an arbitrary time in the range from 1 to 60 minutes. This value will be recalculated every minute. Results are readable on the display and can be printed out. They are not, however, stored in the periodic buffer.

1.6.11 Heat meter (option)

Following heat meter will be supported:

- Calec MB or ST (Aquametro)
- Multical 610 (Kamstrup)
- SensyCal (ABB)
- 2WR5 (Landis + Gyr or Siemens)

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1.6.12 Schematic of the metered value processing sequence

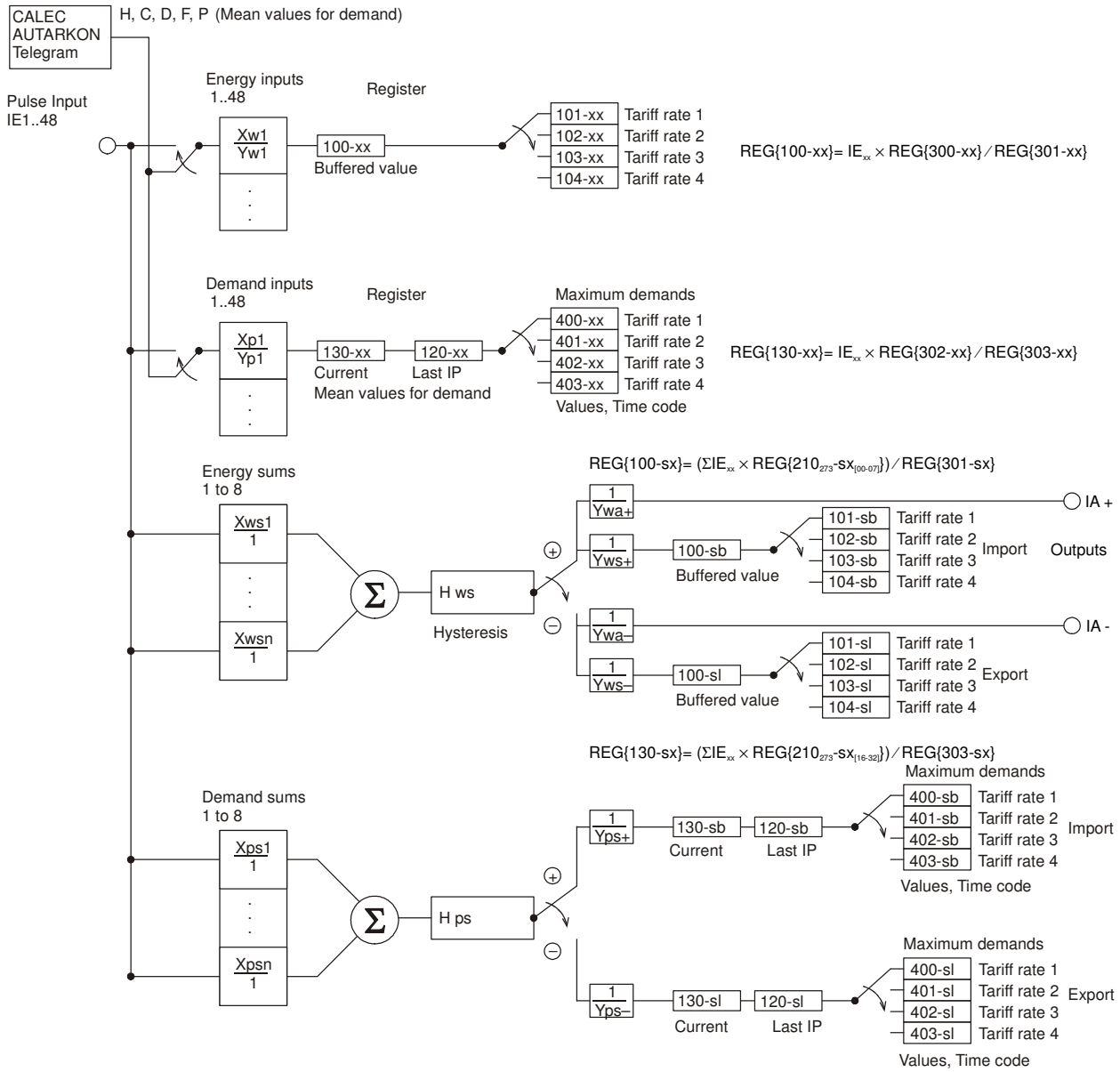

Figure 2, Schematic of the metered value processing sequence

1.7 Time management

The demand values must be acquired and calculated within a defined time frame. This is defined by the start and end time and the time period of the individual measurements (integration or measuring period duration).

1.7.1 Real time clock

The inbuilt real time clock has a battery reserve supply and therefore continues to operate during mains supply outages. During the activated Summertime changeover it should be noted that the clock cannot be set synchronized in the time frame of the „double“ hour because of the ambiguous interpretation of the time set. In such cares the equipment ignores the command. If the equipment contains a radio clock then any attempts to set or synchronize the clock by any other means will be ignored.

1.7.2 Automatic summer/winter time changeover

If desired the equipment can take care of switching over to summertime. The switching times can be programmed in advance for the following five years. If there is no entry in the table for the current year then the seasonal times applying in Germany are used (summertime from the last Sunday in March to the last Sunday in September). When using the table care must be taken to program both times as Winter times (e.g. if the changeover Summer to Winter shall take place at 03:00 hours Summertime then 02:00 hours must be set).

After restart the summertime changeover is active. Summertime switching is not necessary in equipment fitted with a radio clock because the clock always supplies the correct time.

1.7.3 Radio clock

If the unit is equipped with a radio clock (GPS) and the radio clock is active, a small "**F**" is shown on the display next to time. The radio clock time is transferred once a minute. So as not to disrupt timing, the real time clock must not be set manually while the radio clock is active. Faults in the radio clock are shown on the display (see section 4.1, fault displays and LCD display, standard display).

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1.7.4 Automatic summer/winter time and radio clock

If the unit has a radio clock and it is active, the clock can not be synchronized (SYN input) but it can be set. Automatic summer time switchover must always be active (even if the radio clock is active). Otherwise switchover is not performed.

1.7.5 Measuring period (Tm)

The measuring period is the time over which the overage demand value is established. It can be set in steps of 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 minutes. Measurement can commence only in the time raster of the measuring period. At the end of a measuring period the actual status of the demand register is printed and transmitted to the storage/communication unit and the demand register is reset to zero.

1.7.6 Sliding measuring period

When using the sliding measuring period the demand values are integrated over a multiple quantity of the actual measuring period, although they are stored and printed at the end of every measuring period. For example, if the block Tm is 5 min. and the sliding period Tm is 15 min., then every 5 min. the demand values of the previous 15min. will be stored.

1.7.7 Starting the measurement

For any maximum demand calculation it is necessary to start a measurement. No maximum demand register or cos(phi) calculation will function without having done this. Energy values and summations will be metered continuously however. Some parameters (e.g. number of inputs/sums, measuring period Tm) can not be changed while a measurement is running. At the start of the measurement the status of the energy registers are transmitted to the recording/communication unit and printed out. To start a measurement the user must define the start time. The green LED on the front panel next to the display will flash. When the start time is reached the LED will light continuously. The equipment must of course have been switched on before the start time occurs.

1.7.8 End of measurement

The end of a measurement can, like the start, only be manually initiated. The actual status of the energy registers will be saved and printed. The measurement will cease at the instant determined by the user.

1.7.9 Recording break (interruption)

Metering can be interrupted briefly to allow exchange of data carriers (e.g. diskette, memory card or printer paper). So as not to lose a measuring period the end of a measuring period should have elapsed before the recording break is activated. Obviously the exchange should then be completed before the end of the measuring period in progress at the time. The energy values of the last measuring period are printed out and transmitted to the memory/communication unit when recording break occurs and ends. Wait for the end of the write operation to external media or the end of printer output and observe the operating instruction for modules!
The recording interruption is displayed by the flashing green LED of the CPU.

1.8 Tariff rate dependent processing

DataFW4 processes up to 4 tariff rate calendars each with up to 4 energy and maximum demand tariff rates. The number of tariff rates is parameterized via the parameterization software DMFPARA or the keypad. If the number of maximum tariff rates is set to "0", no more maximum demands are calculated. While measurement is in progress the number of tariff rates can not be changed.

1.8.1 Tariff control

Depending on the version of the equipment there are 3 types of tariff rate control:

- The control inputs TR1, TR2 and MRK determine the tariff rate.
- The internal, parameterizable tariff rate calendar determines the tariff rate.
- The control inputs and the internal tariff rate calendar are logically combined by the tariff rate combination (OR operation).

The currently valid tariff rate is constantly interrogated. Changes to the energy tariff therefore apply **immediately** depending on which tariff control is active, the valid maximum demand tariff is determined 5 seconds before the end the current integration period (external tariff rate control) or at the end of the current integration period (internal tariff rate control) and remains constant throughout an integration period. The current tariff rate is always shown on the display.
If tariff rate control is deactivated, DataFW4 always uses energy and maximum demand tariff rate 1.

1.8.2 Tariff rate calendar

DataFW4 features four independent, hierarchically structured tariff rate calendars with up to 4 energy and maximum tariff rates each and a common public holiday table for 50 public holidays. Each register (input register or summation register) can be assigned to any tariff rate calendar which then determines its tariff rate structure.

A tariff rate calendar is structured with 3 hierarchical levels:

- seasonal programs (up to 6)
- weekly programs (up to 8 tariff types)
- daily tariff programs (up to 15 daily programs with 16 switching times each)

The tariff rate calendar must only be parameterized via the parameterization software DMFPARA. Please consult the manual for the parameterization software for the procedure to follow.

Seasonal programs: For setting the seasons (and other time periods with special tariffs or other special requirements) select the "Season" field in the "Tariff calendar" menu item.

Season	Begin
1	MM-DD 00:00
2	MM-DD 00:00
3	MM-DD 00:00
4	MM-DD 00:00
5	MM-DD 00:00
6	MM-DD 00:00

MM-DD 00:00 := Month - Day Time

Example: 04-01 00:00 1. April, 00:00 (=: 31. March, 24:00)

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Weekly programs:

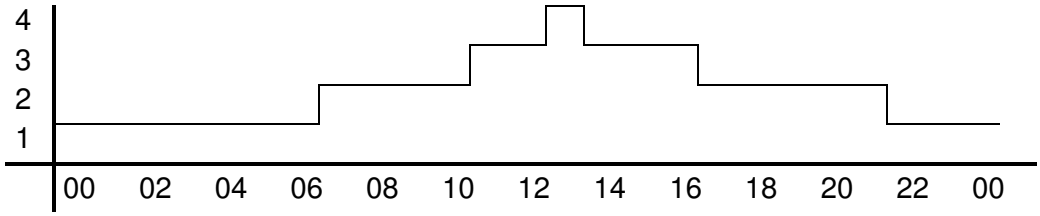
Season	Day of the week							
	Mo	Tu-Th	Fr	Sa	Su	FT 1	FT 2	FT 3
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3								
4								
5								
6								

Daily tariff:

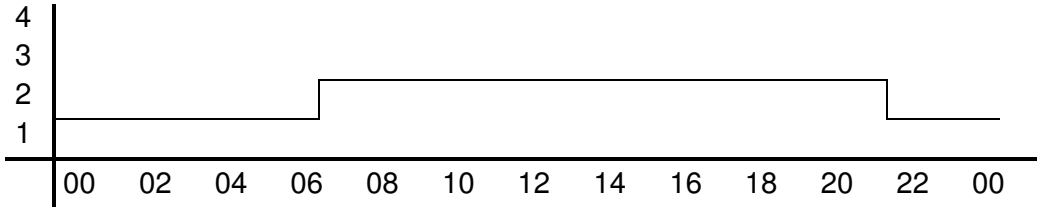
Example: Tariff rate for 4 energy and 2 demand tariffs:

Time		Tariff	
from	to	Energy	Demand
00:00	06:00	ET1	DT1
06:00	10:00	ET2	DT2
10:00	12:00	ET3	DT2
12:00	13:00	ET4	DT2
13:00	16:00	ET3	DT2
16:00	22:00	ET2	DT2
22:00	00:00	ET1	DT1

Energy tariff:



Demand tariff:



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1.8.3 Tariff rate inputs

Tariff inputs TR1, TR2 and MRK determine the actual energy and demand tariffs insofar as this is desired and provided in the customer specific hardware. Which inputs are used for setting the tariffs and in which conditions these inputs correspond to which tariffs are all freely programmable.

Default:

	TR2	TR1	MRK
Mask energy	[X]	[X]	[ ]
Mask demand	[X]	[X]	[ ]

TR2	TR1	MRK	Energy	Demand
0	0	0	ET1	DT1
0	1	0	ET2	DT2
1	0	0	ET3	DT3
1	1	0	ET4	DT4

Example: 4 energy and 2 demand tariffs (with TR1, TR2 and MRK):

	TR2	TR1	MRK
Mask energy	[X]	[X]	[X]
Mask demand	[X]	[X]	[X]

TR2	TR1	MRK	Energy	Demand
0	0	0	ET1	DT1
0	0	1	ET1	DT2
0	1	0	ET2	DT1
0	1	1	ET2	DT2
1	0	0	ET3	DT1
1	0	1	ET3	DT2
1	1	0	ET4	DT1
1	1	1	ET4	DT2

1.8.4 Tariff identifiers

If the tariff control via the tariff inputs is active, the tariff identifier consists of the status of inputs TR1, TR2 and MRK. If the internal tariff calendar is active then the actual demand tariff will be employed in place of the status of TR1 and TR2. Input MRK (measured value marker) is always incorporated in the tariff identifier byte. This is printed out at the end of the measuring period and stored on a diskette or on paper; remote interrogation is not possible.

1: If the tariff rate inputs are active, the tariff identifier (base marking byte) is formed from the state of the inputs TR1, TR2 and MRK. The base marking byte X is calculated as follows in accordance with the assignment of the tariff rate control inputs:

$$X = (MRK) \times 1 + (TR1) \times 2 + (TR2) \times 4$$

0:= input OFF; 1:= input ON

2: If the internal tariff rate calendar is active, instead of the state of TR1 and TR2 the current demand tariff rate (MT) of the tariff rate calendar is used. The input MRK (measured value marking) is always placed in the base marking byte:

$$X = (MT - 1) \times 2 + (MRK) \times 1$$

3: If the tariff combination is active, the external and the internal tariff rate calendar (see points 1 and 2) are combined.

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1.9 Measured value memory

1.9.1 Cyclic buffer

The measured value memory of the DataFW4 is subdivided into two buffer areas. These areas are organized as cyclic buffers CB-01 (PP01) and CB-02 (PP02) and store the calculated energy and demand values cyclically. Up to 16 values (input metered values and/or sums) can be stored in each buffer. The assignment of the buffer is parameterized, i.e. during parameterization the inputs or sums, summation balances that are to be stored in each buffer are defined.

! Only the first 32 inputs can be stored in the buffers!

! If the number of input metered values or the sums are changed or the summation balance calculation is reparameterized, the assignment of the cyclic buffer is affected.

The following applies:

- Parameterization of the number of input metered values:
  All input metered values are taken from the buffer assignment.
- Parameterization of the number of summation registers or the summation balance calculation:
  All summation registers are taken from the buffer assignments.
- It is advisable to parameterize the number of input metered values and summation registers before the buffer assignment.

1.9.2 Storage of the sums

The cyclic buffer of the DataFW4 can be assigned as follows:

Sum values	up to 8
Results of summation balance calculation	up to 16 (8 for import, 8 for export)
The following is stored	the first 4 summation balances or all sums
Sequence in the buffer (import: "+", export: "-")	sum1+, sum1-, sum2+, sum2-, sum3+, sum3-, sum4+, sum4-

! **While summation balance calculation is active it is <u>not possible</u> to store the results of summation registers 5 to 8 in one of the two cyclic buffers.**

1.10 Pulse and signal outputs

DataFW4 can output summated pulses, tariff states and integration period synchronization directly and locally. The signal outputs can be freely parameterized and are available in the following technologies:

- Momentary pulse output, electronic (standard, IAW)
- Momentary pulse output, mechanical (option, IAWme.)
- Bipolar current pulse output (option, IAD).

DataFW4 has up to 8 parameterizable outputs. By parameterization any output can be routed to any terminal and assigned any signal. Several outputs can be assigned to the same signal. If this parameterized assignment is changed for one pulse output, the pulse buffer is cleared.

A pulse output can buffer up to 1000 pulses. As soon as this value is exceeded, the equipment sets a fault bit in the device status. This fault bit has to be reset manually by the user on the keypad.

The following signals can be output signals:

- Summated output signals 1 to 8 for import or export
- Integration period output MPA. The integration period output can also be wired from the radio clock as an option.
- Tariff rate outputs TRF1 and TRF2
- Maximum reset RST

1.10.1 Tariff rate output

The tariff rate outputs TRF1 and TRF2 can be parameterized such that a defined output state appears for each combination of energy and maximum demand tariff rates. After a RESTART the following assignment applies:

Energy tariff	Output **TRF2**	Output **TRF1**
ET1 (AT1)	0	0
ET2 (AT2)	0	1
ET3 (AT3)	1	0
ET4 (AT4)	1	1

Example for "negated (inverted) TRF" (see DMFPARA):

Energy tariff	Output **TRF2**	Output **TRF1**
ET1 (AT1)	1	1
ET2 (AT2)	1	0
ET3 (AT3)	0	1
ET4 (AT4)	0	0

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2 Module Description

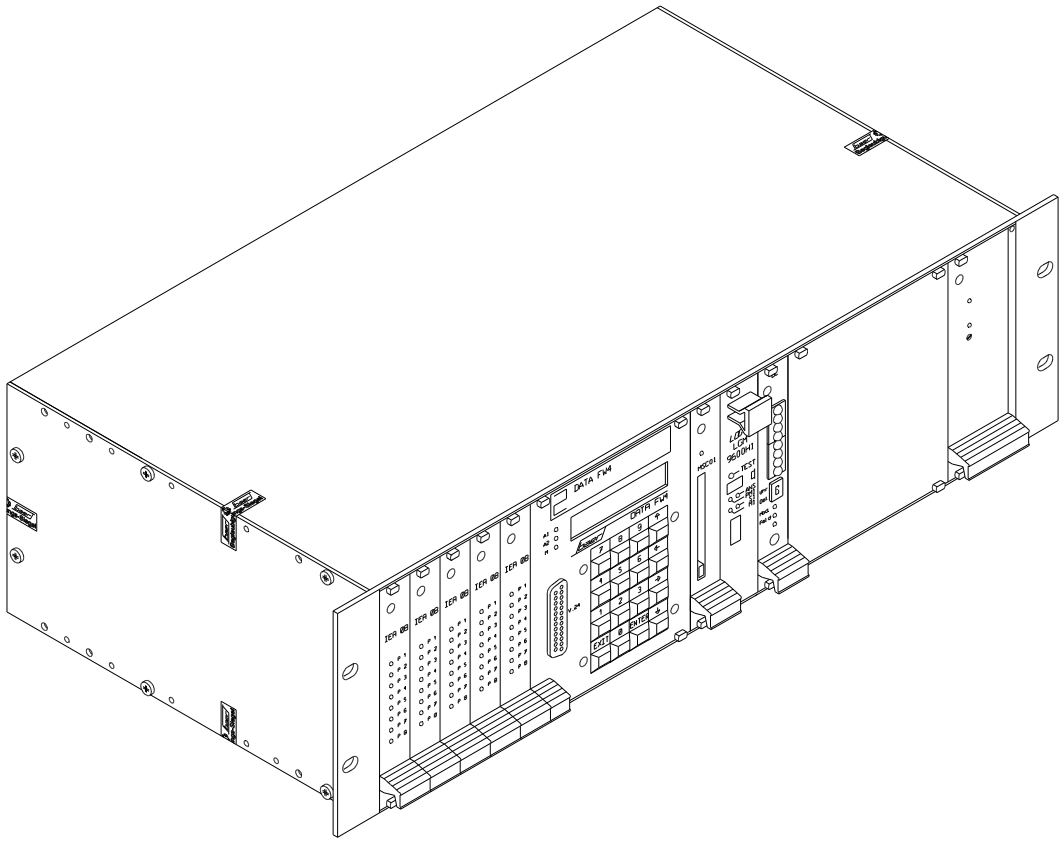

Figure 3, DataFW4 with 40 pulse inputs, MemoryCard unit, modem, radio clock and power supply unit

Depending on the device specifications, a DataFW4 device can consist of the following components:

- CPU with keyboard, LCD display and RS232 (V.24) interface
- Main memory: MSC01 with MemoryCard (PC-Card) or DS01 unit or VU25/VU26 unit
- Modem, RS 232 interface or M-Bus interface
- Pulse inputs
- Pulse outputs
- Control inputs
- Control outputs
- Radio clock
- Power supply unit
- Centronics interface for external printer
- RS232 interface for load check

2.1 Keyboard with LCD display

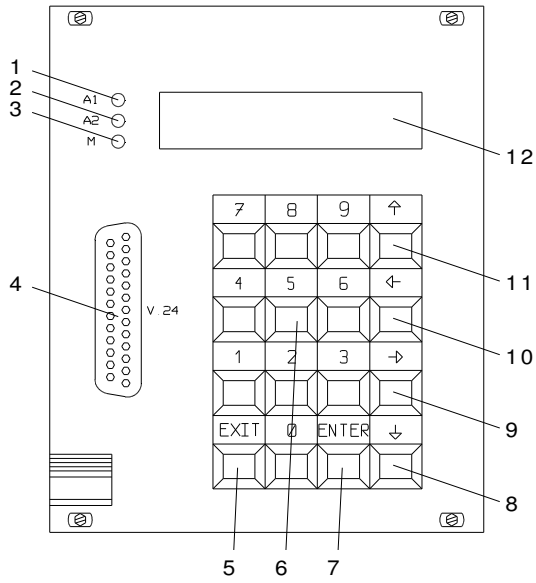

Figure 4, Keyboard

1: **LED A1** (red, blinking):
an error has occurred (warning)

2: **LED A2** (red, blinking):
an error has occurred (critical error)

3: **LED M** (green, blinking):
measuring will soon begin

LED M (green, lit):
measuring is active

4: **RS232 (V.24) service interface**

5: **ENTER**:
Accepts an entry (exception: error inquiry)

6: **Numbers**:
For entering numeric values when setting parameters.

7: **EXIT**: Leaves a menu item

Note: If you press the EXIT key several times you will be returned to the permanent display.

8: **Cursor ↓**: Pages through individual (next) menu items
Activate the main menu

9: **Cursor →**: Positions the cursor in numeric entry fields (to the right), or it is used for selecting table values

10: **Cursor ←**: Positions the cursor in numeric entry fields (to the left), or it is used for selecting table values

11: **Cursor ↑**: Pages through individual (prior) menu items

12: **Display**: 2x16 characters

2.1.1 RS232 (V.24) service interface

Type: 25 pole SUB-D plug in compliance with ISO 2110, Connector pin assignment V.24 / RS232/DIN 66020

Socket function: Parameterization and read-out of the reset data through a PC.

The pin assignment of the V.24 socket on the CPU front panel is as follows:

Connection	Designation	Additional information	
2	TxD	Input	Receive data
3	RxD	Output	Transmit data
4	RTS	Input	Connected to 5
5	CTS	Output	Connected to 4
6	DSR	Output	Operational
7	GND		Signal ground
20	DTR	Input	DEE Operational

The service interface is used to program the DataFW4 unit with a fixed baud rate (9600 baud). It is implemented as a 25 pin SUB-D connector (female) according to ISO2110, the pin allocation is according to V.24/RS232C/DIN 66020.

Programming of the DataFW4 is done using the programming software DMFPARA. Please read the user manual of the programming software DMFPARA for instructions on programming.

For the connection between a DataFW4 and a PC, a programming cable or modem cable (#6998) is required. Plug the programming cable into a free COM port of the PC/Laptop and into the service interface of the DataFW4.

DataFW4 (25 pins)			**PC (25 pins)**	**PC (9 pins)**		
Input/Output	**Pin No.**		**Pin No.**	**Pin No.**	**Input/Output**	**Standard usage**
Input	**2**	—	**2**	**3**	Output	TxD (transmit data)
Output	**3**	—	**3**	**2**	Input	RxD (receive data)
	7	—	**7**	**5**		GND (signal ground)

2.1.2 LED display on CPU

The three light emitting diodes on the left, next to the LCD display give information on the following items:

- A1 (red, blinking) an error has occurred (warning)
- A2 (red, blinking) an error has occurred (critical error)
- M (green, blinking) measuring will soon begin
- M (green, lit) measuring is active

2.1.3 LCD Display

The LCD display gives the user system information and advice on how to proceed. The menu-controlled presentation shows you which program item you are in. For this purpose, the last characters in the second display line are used as an information field to give the user help in an abbreviated form.
The abbreviations have the following meaning:

Su, Mo, Tu, We, Th, Fr, Sa	Day of the week
Tm	measuring period (standard display)
I=	Number of channels/inputs (standard display)
ET= ET (AT)	Energy tariff (standard display)
DT= DT, MAX (MT)	Maximum demand tariff (standard display)
	Alarm (fault present)
PP-n, P-n	Cyclic buffer (periodic buffer) n
PER. PUF. INP	Cyclic buffer (periodic buffer) input
PER. PUF. SUM	Cyclic buffer (periodic buffer) summation
INFO	Information
PARA, PROG	Parameterization
DELETE	Delete (clear) alarms
MED	Medium
MD INP	Maximum demands (input)
MD SUM	Maximum demands (summation)

INP, I:	Inputs
W: 1.000 Tm: 1.000	Cos (φ) for integration time W (1..60 min) und Tm
SUM+/-n, SU n, S+/-n	Summation +/- n
RST, R	Maximum demand reset
T	Tariff
BAUD, Bd	Baud rate

2.1.4 LCD test

Call by pressing the ENTER-key in menu item: " MAINTENANCE → Display Test" .

2.1.5 Roll display

The ROLL display is called up under menu guidance. Before the button for the scrolling display is used the scroll display menu must be programmed with addresses (refer to the operating instructions on parameter setting). The contents of the address table must be in sequential form. If the address table is not occupied but the scroll button has been primed then the display will indicate: „Scroll display not occupied“.

The control input ANZ must have been activated during parameterization. If this is not the case nothing will happen. There are two ways of calling up the individual menu items of the ROLL main menu:

- **Scrolling with the keys:** Every time you press the "0" key or the ROLL (ANZ) input is actuated the next menu item is shown on the display. If there are no further menu items, the standard display is shown again. If the EXIT key is pressed in the ROLL menu, the menu is exited and the standard display is shown again.
- **Automatic scrolling in the main menu with set time interval:** For automatic scrolling of the ROLL display, the time must first have been set (in seconds) that each menu item is to be visible in the LCD display using the parameterization program DMFPARA. After the set time has elapsed the next menu item is called up. If the "0" key is pressed or the ANZ input actuated during main menu display the time loop for the menu item is interrupted and the next menu item is displayed. If you press the EXIT key the menu is exited and the standard display shown again.

The scroll button can only be primed via the parameter setting program. If it has not been primed then the display will indicate: „Scroll display not activated“.
If you happen to be in the menu structure then you can depress the scroll menu button to abandon the display menu; the standard display briefly appears and then if the scrolling display is activated (and occupied) the first menu item appears in the LCD display.

The menu structure of the ROLL display can include up to 50 menu items (see Appendix B). The number and sequence of the menu items is defined during parameterization (see the operating manual of the parameterization software DMFPARA).

Each menu item can be assigned a freely parameterizable text of up to 8 characters. If no text is parameterized the display shows the register address bottom right providing the value output leaves sufficient space for it.

If a text has been parameterized it is always displayed. This might cause characters of the register value to be overwritten. Leading spaces in the text are ignored.

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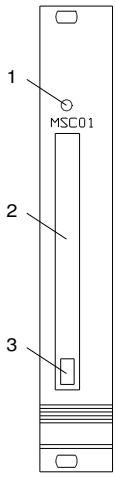
2.2 MemoryCard module MSC01



1: LED
Status indication of the Memory Card

2: Slot for the Memory Card

3: Ejection button:
Only press if the green LED is **not** lit

Figure 5, MemoryCard module MSC01

This plug-in module has a processor with 512 KB of RAM and 256 KB of ROM. In addition to the two internal cyclic buffers it also features a slot for a memory card for PCMCIA/JEIDA standard. A green LED on the front panel of the module indicates status and fault displays module.

The MemCard unit MSC01 allows measured data (cyclic buffer: maximum demand values), special occurrences (spontaneous buffer: such as e.g. power failure, change of parameter, etc.) to be saved for a longer period of time in periodic buffers. In addition, the internally saved data can be filed a second time on a SRAM memory card (PC card) to the PCMCIA/JEIDA standard. The memory card can be read by any PC with standard commercially available reading devices.

The reading software can be ordered separately!

2.2.1 Inserting the memory card

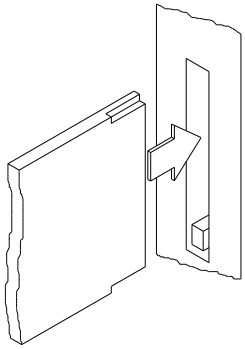


Figure 6, Inserting the memory card

When inserting the memory card ensure that the connector side of the memory card enters the MSC01 board first. Also make sure that the memory card is inserted in the recording device with the guide slots in the same position as shown in the figure 6. The two guide rails of the MSC01 board keep the memory card in position inside the device. Push the memory card into the slot as far as it will go and press the memory card carefully until you can feel it latch. The LED indicates that the card has been inserted correctly by lighting up briefly.

! The memory card should be formatted be memory card reader or in menu item "MAINTENANCE → Format Memory Card".

2.2.2 Removing the memory card

To remove the memory card, activate the eject button below the Memory Card.

! When you remove the memory card, make sure the LED for the MSC01 card is not lit because, if this is so, then the Memory Card is being accessed!
No recording interruption is required to change the memory card!

2.2.3 LED on the front

- If there is no Memory Card in the MSC 01, the LED on the front of the MSC 01 card lights up.
- If a write-protected Memory Card is in the MSC 01, the LED on the front of the MSC 01 card lights up.
- If the Memory Card is not formatted, the LED blinks continuously with very short, nearly periodic interruptions.
- If the battery has not been put into the Memory Card or the battery is dead, the LED only lights up when the Memory Card is being written on (same as a Memory Card with a loaded battery, but an Error will be indicated on Display/Keyboard)

2.2.4 Notes on handling the memory card

! Non-observance of the following points can cause destruction of the memory card or the system!

- The memory card must not be bent or subjected to similar strain.
- Never drop the memory card.
- The memory card must be kept dry and free of dust.
- Do not expose it to extreme temperatures or humidity.
- Always keep the memory card in the packaging supplied and avoid static charges.
- Never touch the terminal pins of the memory card.
- Never put the memory card in a slot which is not standardized for this memory card.
- Never force the memory card into the slot.
- Never remove the memory card from the unit while it is being written to.

2.2.5 Battery supply

Since the SRAM inside the Memory Card is a volatile memory, it needs a battery power supply so that data is not lost when the system's power supply is turned off. A special IC supervises the supply voltage. It switches the card's internal SRAM supply line from the external supply voltage to the built-in lithium battery as soon as the external voltage supply is switched off. Through a special IC function, no data will be lost when the replaceable battery is removed. A built-in capacitor is kept continuously charged during normal operation. As soon as the battery is removed, the IC switches the capacitor voltage to the RAM supply lines which allows the stored data to be maintained for a period of 5 minutes while the lithium battery is being replaced.

Depending on the memory capacity of the card, the life of the battery ranges between six months and five years if the card works in the data hold mode.

Life of a battery in the Panasonic Memory Card:

Memory Card capacity	Ambient temperature	
	25°C	40°C
64 kByte	5 years	3 years
128 kByte	5 years	2 years
256 kByte	4 years	1 year
512 kByte	2 years	6 months
1 MByte	1 year	3 months

To guarantee that saved data is secure, a minimum battery voltage of 2.65 V must be maintained. At a battery voltage of <2.37 V, data will be secure but the battery should be replaced as soon as possible.

2.2.6 Formatting the memory card

A memory card is formatted when the first 10 bytes are:

A5	5A	00	FF	A5	5A	00	FF	A5	5A	hexadecimal

A memory card is deemed to be erased when it is reformatted when:

44	41	54	41	2D	46	57	D7	hexadecimal

You can format and erase the memory card in the MSC01 board. The FORMAT function is password-protected and can be called up via the keypad or the parameterization software DMFPARA or in menu item "MAINTENANCE → Format Memory Card". The password must be set during parameterization.

The memory card can also be formatted via one of the following memory card readers:

- MCM30,
- JA-232-A
- MSR10

Introduce the memory card into the reader, start the PC program MSC2DRA and activate the FORMAT field.

If the memory card is formatted in the MSC01 board then the date, the time and the register readings of the last integration period to have been completed are stored instead of the data corresponding to the start identifier.

2.2.7 Number of integration period entries

The basic values for the size of the internal measured value memory of the MSC01 are:

Number of bytes per integration period (NIP) are:

$$NIP = (\text{no. values in CB01}) \times \frac{\text{no. of decades in CB01}}{2} + (\text{no. values in CB02}) \times \frac{\text{no. of decades in CB02}}{2}$$

Number of integration period in internal measured value memory (NIPM) of the MSC01 are:

$$NIPM = \frac{486000}{NIP + 7}$$

- The number of integration period entries that can be stored on the memory card depends on the capacity of the memory card and the number of metering and summation registers. The following basic values apply:

Number of integration period on the memory card (NIPMC):

$$NIPMC = \frac{\text{Size of the memory card (bytes)} - 7362}{NIP + 9}$$

Examples:

Integration period Tm=15 min. and 4 decades per value:

MemoryCard	Values per integration period	Number of integration period	Days
512 kByte	8	20600	214
512 kByte	16	12600	131
512 kByte	32	7000	72
1 MByte	8	41200	428
1 MByte	16	25200	262
1 MByte	32	14000	144

Internal memory:

Internal memory	Values per integration period	Number of integration period	Days
512 kByte RAM	8	21100	218
512 kByte RAM	16	12400	129
512 kByte RAM	32	6800	70

2.2.8 Writing to the memory card

If the memory card is deemed to be erased or all its parity checks are indicated as correct, the device parameters, the content of the spontaneous buffer and the content of the cyclic buffers are transferred. Multiple copying is possible.

The device parameters are used to identify records uniquely so that they can be correctly assigned when they are read out again. The following device parameters are transferred to the memory card from the main memory:

- SCTM sub position number (5 digits)
- Integration period duration
- Assignment of the cyclic buffers CB-01 and CB-02
- Software version of the MSC01 board
- Radio clock reception active
- Password check
- Transmission rate of the serial interface
- Number of minutes from 01.01.1980, 00:00 o'clock until the last time recorded as winter time.
- Number of minutes from 01.01.1980, 00:00 o'clock until the last time recorded as summer time
- Equipment status
- Size of the cyclic buffer of the memory card in bytes
- Size of the cyclic buffer of the memory card in integration periods
- The last clock time received by the CPU (including date)
- The clock time and date of the last integration period
- Maximum demand values of the last integration period to have been completed for all metered value inputs and summation registers
- Energy values after the last integration period completed for all metered value inputs and summation registers
- Capacity of the memory card in integration period entries.

Spontaneous buffer:

The spontaneous buffer of the memory card is parameterized such that 100 entries can be stored exactly like the main memory. However, assignment must always be free, i.e. 99 entries can be stored.

If a new memory card is inserted, up to the last 89 entries are transferred to prevent the first entry being overwritten again on storage because of the circulating buffer structure.

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2.3 Memory module DS01

Figure 7, Memory module DS01

This plug-in module has a processor with 512 KB of RAM and 256 KB of ROM with two internal cyclic buffers (see MemoryCard module MSC01).

- The basic values for the size of the internal measured value memory of the DS01 are:

Number of bytes per integration period (NIP) are:

$$NIP = (\text{no. values in CB01}) \times \frac{\text{no. of decades in CB01}}{2} + (\text{no. values in CB02}) \times \frac{\text{no. of decades in CB02}}{2}$$

Number of integration period in internal measured value memory (NIPM) of the DS01 are:

$$NIPM = \frac{486000}{NIP + 7}$$

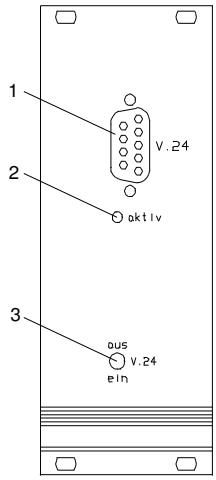
Examples:

Integration period Tm=15 min. and 4 decades per value:

Internal memory	Values per integration period	Number of integration period	Days
512 kByte RAM	8	21100	218
512 kByte RAM	16	12400	129
512 kByte RAM	32	6800	70

2.4 VU25 Unit

This board features a processor with 256 KB RAM and 128 KB ROM. VU25 does not have an external memory medium. Instead the data memory can be read out locally via an RS232 (V.24) interface on the front panel
VU25 and VU26 are functionally identical. The only difference is the V.24 type of connector at the front.



1: RS232 (V.24) interface

2: LED

Lit if RS232 interface active

3: Switchover between internal and external RS232 (V.24) interface
- internal modem interface (off/aus)
- RS232 (V.24) interface (on/ein)

Figure 8, VU25 unit

Switchover between data readout via the interface module for data interrogation or the local RS232 interface is performed manually with the switch on the front panel. The green LED on the panel lights up if the RS 232 interface is active.

! Please check the switch position after you have used the RS232 interface. Remote data interrogation via the modem is not possible if the switch is in the "front" position!

Number of integration period entries

Examples:

Integration period Tm=15 min. and 4 decades per value:

Internal memory	Values per integration period	Number of integration period	Days
256 kByte RAM	8	9100	94
256 kByte RAM	16	5300	55
256 kByte RAM	32	2900	30

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RS232 (V.24) interface:

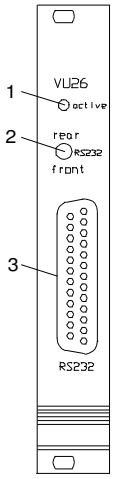
Type: 9 pole SUB-D plug in compliance with ISO 2110, Connector pin assignment V.24 / RS232/DIN 66020

Socket function: Read-out of the data through a PC.

The pin assignment of the V.24 socket on the VU25 unit is as follows:

VU25 (9 pins)			**PC (9 pins)**		
Input/Output	**Pin No.**		**Pin No.**	**Input/Output**	**Additional information**
Input	**2**	——	**3**	Output	TxD (transmit data)
Output	**3**	——	**2**	Input	RxD (receive data)
	5	——	**5**		GND (signal ground)
Output	**7**	——	**8**	Input	CTS (clear to send)
Input	**8**	——	**7**	Output	RTS (request to send)

2.5 VU26 Unit



1: LED:
Lit if RS232 interface active

2: Switchover between internal and external RS232 (V.24) interface
- internal modem interface (rear)
- RS232 (V.24) interface (front)

3: RS232 (V.24) interface

Figure 9, VU26 Unit

This board features a processor with 256 KB RAM and 128 KB ROM. VU26 does not have an external memory medium. Instead the data memory can be read out locally via an RS232 (V.24) interface on the front panel
VU25 and VU26 are functionally identical. The only difference is the V.24 type of connector at the front.

Interface Sub D female, 25 pins (Modem cable 1:1):

VU26 (25 pins)			**PC (25 pins)**		
Input/Output	**Pin No.**		**Pin No.**	**Input/Output**	**Additional information**
Input	**2**	——	**2**	Output	TxD
Output	**3**	——	**3**	Input	RxD
Input	**4**	——	**4**	Output	RTS
Output	**5**	——	**5**	Input	CTS
	7	——	**7**		GND

or

VU26 (25 pins)			**PC (9 pins)**		
Input/Output	**Pin No.**		**Pin No.**	**Input/Output**	**Additional information**
Input	**2**	——	**3**	Output	TxD
Output	**3**	——	**2**	Input	RxD
Input	**4**	——	**7**	Output	RTS
Output	**5**	——	**8**	Input	CTS
	7	——	**5**		GND

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Number of integration period entries

Examples:

Integration period Tm=15 min. and 4 decades per value:

Internal memory	Values per integration period	Number of integration period	Days
256 kByte RAM	8	9100	94
256 kByte RAM	16	5300	55
256 kByte RAM	32	2900	30

2.6 Input and output boards

DataFW4 can be fitted with up to 6 input boards (type IEA08).

Each input board contains 8 identical inputs. The boards are available in a choice of different technologies that can be combined.

- Pulse input S0 (IES)
- Pulse input momentary (IEW)
- Pulse input bi-polar (IED)
- Signal current inputs (analogue)

Inputs:

IES **Pulse input S0**

S0 inputs are active inputs. They not only supply the pulse generator with a signal voltage but also with an auxiliary voltage.

Only connect passive pulse generators!

S0 generators can contain their own electronics without needing to have their own power supply unit. The limit currents and voltages are defined in the S0 specification to DIN 43864. S0 inputs must be able to supply 10 mA at 800 Ω (to power the pulse generator) and detect a current flow of 2.2 mA as "Off". They must not supply more than 27 V. The maximum cable length is 0.5 m.

S0 inputs are therefore also suitable for simple volt-free contacts and passive opto-coupler and transistor generators. They are also frequently used for control cables (tariff rates, reset etc.).

IEW **Pulse input momentary**

Momentary pulse inputs are supplied from the generator. The metering pulses are transmitted directly as voltage pulses. In practice a wide variety of voltages and types of current are used.

Momentary pulse inputs can be operated with DC or AC voltages of 24 V up to 265 V without modification. The maximum pulse frequency is 10 Hz, the current consumption is under 10 mA.

Continuous current (pulse duration ∞) is permissible. IEW modules are therefore suitable for control cables.

IED **Pulse input bipolar current**

Bipolar current inputs are passive inputs, i.e. they are fed from the pulse generator and are therefore volt-free. Bipolar current pulses are DC voltage pulses with alternating polarity. Traversing the 0 V line counts a pulse. It is also possible to use a constant DC voltage whose polarity changes for each metering pulse instead of DC voltage pulses.

The voltage is usually 24 V but can vary from 19 V to 60 V. The input current of the electronic bipolar current inputs is less than 2 mA at 24 V.

Because a metering pulse represents a polarity change in the input voltage, IED modules generate a complete pulse of approx. 40 ms duration (20 ms pulse, 20 ms interval) internally for each polarity change. This must be taken into account in the maximum pulse frequency (< 25 Hz). On request, IED modules can also be supplied with a pulse duration of 140 ms (90 ms pulse, 50 ms interval) that can then be used

with a pulse frequency of up to a maximum of 7 Hz.
Bipolar current transmission lines are largely immune to noise and must be used for long distances. Under certain ambient conditions (adjacent current carrying cable, long distances), a screened cable of sufficiently large cross section must be used.
With pulse inputs of 40 ms pulses the duration of the pulse and the interval must both be set to 10 ms by parameterization (using DMFPARA). Pulse debouncing will not be able to detect these signals otherwise

IEI Pulse input inductive

A resonant circuit is formed by the inductive pulse input in combination with the LC circuit inside the meter. This is periodically damped by a vane wheel mounted on the rotor spindle giving rise to the pulses. IEI modules are therefore active inputs and energise the pulse generator in the meter. The signal generator must be potential-free, i.e. it must be neither earthed nor connected to other voltage levels. Because the resonant circuit is sensitive to connector cable inductance and capacitance as well as external interference signals, a secure functioning can only be guaranteed for a connector cable length of up to 30cm.

Outputs:

IAD Bipolar current pulse output

DataFW4 bipolar current outputs (IAD) supply a constant DC voltage of ± 24 V. The polarity changes on every metering pulse. The maximum permissible load is 30 mA. Bipolar current outputs require an extra power supply unit in the equipment that is generally used to power other bipolar current outputs in the same equipment. Individual bipolar current output wires must therefore not be connected together (not even via the equipment connected to them). The subsequent bipolar current inputs must be potential-free.

IAW el. Momentary pulse output electronic (solid state)

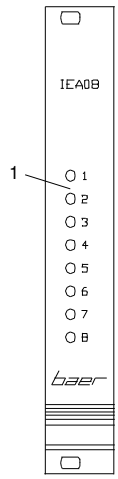
Electronic momentary pulse outputs (IAW el: solid state) behave like relay contacts, i.e. they can be loaded with any type of current up to a maximum value 265 V/100 mA. They combine wear-free operation with a higher switching frequency and are therefore ideal for high pulse frequencies.
They can activate S0 inputs directly.

IAW me. Momentary pulse output mechanical (Relay contact)

Mechanical relays (IAW me: relay contact) are at present the only practical way of offering truly isolated switching contacts. For outputs with switchover contacts, too, only mechanical variation are available at present. The maximum load is 100 mA. Mercury-wetted relays are usually used for pulse transmission lines because only they have the necessary service life (> 10^9 switching cycles) to ensure decades of operation at 5 Hz.

2.6.1 Input board IEA08

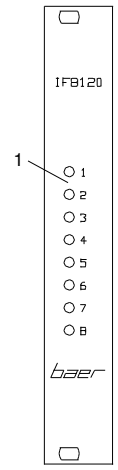
The pulse inputs convert the pulse shapes and signal levels of the input signals that are usual in remote metering to the TTL level used by the CPUs. On the front panel of the input board, 8 yellow LED's show the activity of the 8 inputs.



1: LED

Figure 10, Input board IEA08

2.6.2 Analogue input board IF8120



1: LED

Figure 11, Analogue input board IF8120

The signal current input board measures power in order to establish energy consumption. The power is measured over short intervals, multiplied by the time and the result is summated. This sum is equivalent to the energy consumed. If the sum exceeds a fixed limit value "W", a 90 ms output pulse is triggered and "W" is subtracted from the sum. "W" is designated the pulse weighting and is set such that at maximum demand a pulse frequency of 5 Hz is reached. The demand is measured via an external transducer that converts the measured demand to an injected current (selectable ranges: 0 to 20 mA, 4 to 20 mA or 0 to 50 mA). The resolution of the measurement is 11 or 12 bits depending on the accuracy of the converter used (e.g. AD 574). To calculate the energy from the demand, the demand has to be integrated over a certain period. The integration is approximated by multiplication by finitely small intervals. The time intervals must be minimised to keep the calculation error small. The IF8120 performs a measurement every 100 µs. this results in an interval time of 800 µs for 8 channels.
An IF8120 input board can be used instead of an IEA08 input board (pin compatible).

2.6.3 Control inputs

DataFW4 has up to 7 control inputs. These are implemented in S0 technology only and are parameterized and activated via the service interface. They are used for:

- synchronization (SYN input),
- maximum demand reset (RSTX input),
- external call-up button (ANZ input) of the ROLL display,
- tariff control inputs (TR1, TR2),
- measured value marking (MRK),
- maximum demand inhibit (ABL).

Like the pulse inputs, the control inputs feature signal debouncing. All control inputs must be activated via the keypad or the parameterization software DMFPARA, otherwise they have no function.

- SYN input: The synchronization input is used to synchronize the internal real-time clock via external transmitters/clocks.
- RSTX input: The maximum demand reset can be triggered manually via the RSTX control input. The device triggers the reset approx. 200 ms after the change in the level at the RSTX input if the reset disable is not active.
- ANZ input: The ANZ input allows display scrolling via an external button.
- TR1/TR2 inputs: The tariff rate control inputs permit control from an external source (e.g. by a ripple control receiver). The internal and the external tariff rate control can be active simultaneously. Their functions are coupled via an OR operation.
- MRK input: The MRK input is used for measured value marking and for calculation of the tariff ID byte.

ABL input: The ABL input is used to inhibit maximum demand measurement.

2.6.4 Logical inputs

DataFW4 can be connected with signal outputs of external equipment via the maximum number of 4 logical inputs. In this way the user can log messages that are relevant for metered value processing. In the spontaneous buffer, all incoming signals are stored with the channel number, date and time. S0 inputs are generally used.

The number of logical inputs affects the maximum expansion capability of the DataFW4, i.e. a device configuration consisting of 48 signal inputs, 7 control inputs, 8 signal outputs and 8 summation registers means there is no room for any logical inputs.

2.6.5 Outputs

DataFW4 has up to 8 parameterizable outputs. By parameterization any output can be routed to any terminal and assigned any signal. The following signals can be output signals:

- Summated output signals 1 to 8 for import or export
- Integration period output MPA
- The integration period output can also be wired from the radio clock as an option.
- Tariff rate outputs TRA1 and TRA2

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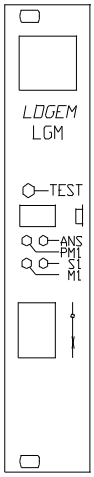
2.7 Modem



See the modem manual for information about the modem.

Figure 12, Modem

The integrated fully automatic slot-in analog modem functions according to the CCITT recommendation V.21 and V.22bis in full duplex mode with transmission rates 300, 1200, 2400 or 9600 (LGM 28.8D1 only) baud and in half duplex mode with a transmission rate of 1200 baud (V.23: LGM 9600H1 only). Dedicated-line operation is also possible.

The modem is connected with the remote metering centre via a leased line or the telephone network. Data interrogation is initiated by the centre.

Modem type:

- LGM 9600H1 (300, 1200 or 2400 baud)
- LGM 28.8D1 (300, 1200, 2400, 4800 or 9600 baud)

The operating mode of the modem is set via DIL switches on the top of the housing of the slot-in modem. To set the mode unscrew the modem and remove it from the DataFW4 housing while the equipment is **switched off**.

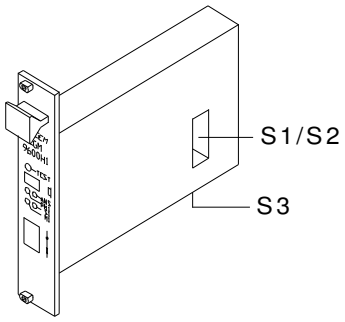
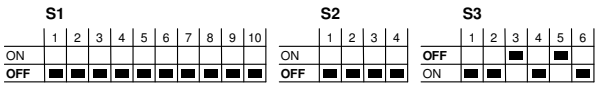


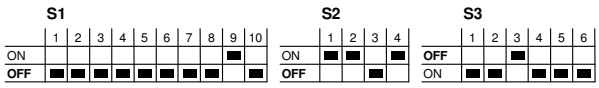
Figure 13, Modem DIL switches

Examples of DIL switch settings S1 to S3:

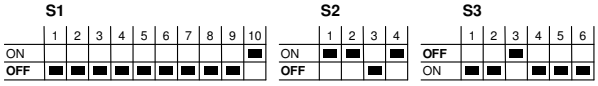
LGM9600H1: 1200 Baud, 7, E, 1 (half duplex, V.23)



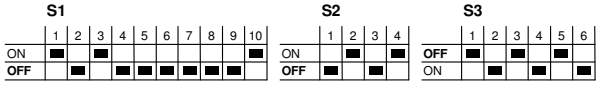
LGM9600H1 or LGM28.8D1: 2400 baud, 7, E, 1 (full duplex, V.22bis)



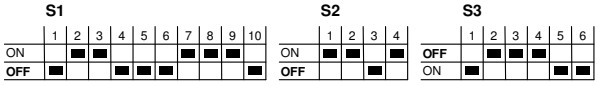
LGM9600H1 or LGM28.8D1: 1200 baud, 7, E, 1 (full duplex, V.22bis)



LGM9600H1 or LGM28.8D1: 300 baud, 7, E, 1 (full duplex, V.21)



LGM9600H1 or LGM28.8D1: 2400 baud, 8, E, 1 (full duplex, V.22bis)
for IEC 60870-Protokoll



LGM28.8D1: 9600 baud, 7, E, 1 (full duplex, V.32)

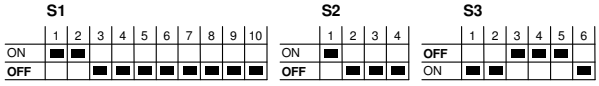
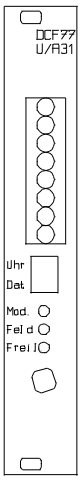


Figure 14, Examples of DIL switches

Please refer to the modem manual supplied for further settings of the DIL switches S1 to S3 and for special modem functions.

2.8 DCF77 radio clock (Applies only in Germany)



See the radio clock manual for information about the radio clock

Figure 15, Radio clock DCF77

The radio clock receives time signals from the DCF77 transmitter in Frankfurt (77,5kHz) and then sets the internal time. The module is installed and the user-specific program entered in the factory. The integration period output (MPA) can be switched directly by the radio clock as an option. The wiring must be prepared in the factory.

During normal radio clock operation, summer time switchover is performed using the summer time table. The unit first converts the time from the radio clock to winter time and then adds one hour if it is summer time according to the table. This has 2 advantages:

- Greater reliability: Switchover in the unit is performed even if the radio clock does not receive a time telegram at the time of switchover
- Greater flexibility: Switchover times are implemented that differ from those of the DCF77 transmitter.

On request it is possible to accept the summer time information from the radio clock. The summer time table is then ignored. The summer time switchover is performed on the next full hour after the summer time announcement from the DCF77 transmitter if no time telegrams are received beforehand. As soon as the first telegram with summer time ID is detected switchover is performed even if the equipment is switched off at this time.

However, the following exceptions apply where the table is still used:

- Hardware failure of the radio clock.
- The radio clock is deactivated.
  Immediately after "RESTART" the radio clock is deactivated. If the time is then set with the parameterization software DMFPARA, the equipment first uses the table as the basis for its summer time calculation.
- Parameterization of the time.
  If the time is parameterized whilst the radio clock has not yet been synchronized (marking "**#**" in the display), it is still not known at this time whether summer or winter time applies. The table is therefore read.

See the radio clock manual for further information.

Radio clock reception can be enabled and disabled via the keypad, the parameterization software DMFPARA or SCTM protocol. If it is enabled, an "**F**" appears in the middle of the

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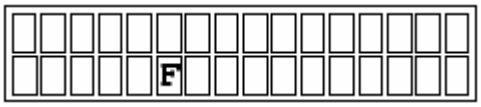
second line of the display next to the current minute. If it is disabled this character is not displayed.



The radio clock is read out once a minute and controls the system time of the DataFW4. If the radio pulses fail for more than 24 hours, an alarm to this effect is shown on the display.
If DataFW4 is activated but the radio clock does not receive data, the internal real-time clock must be set by hand. As soon as the radio clock receives correct data, the internal clock is corrected.

2.9 GPS satellite receiver clock

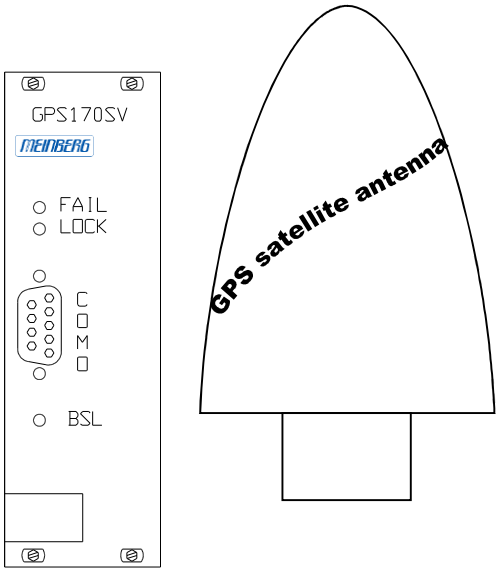


Figure 16, GPS satellite receiver clock

FAIL-LED:
on (red): receiver not synchronized
off: receiver synchronized, correct time received (minimum one satellite can be received)

LOCK-LED:
on (green): correct GPS position (minimum four satellites can be received)

COM 0: serial port (19200, 8N1), RS232-connection to GPSMON32

BSL: pushbutton for firmware upgrade (don't us it!)

See the GPS satellite receiver clock manual for information about the GPS clock

The Global Positioning System (GPS) is a satellite-based radio-positioning, navigation and time-transfer system. The GPS clock is using the "Standard Positioning Service" SPS. Navigation messages coming in from the satellites are decoded by the GPS clock microprocessor in order to track the GPS system time.

The GPS satellites are not geostationary: each of them circles around the earth approx. every 12 hours. The satellite signals can be received only if no building or any other object is in the line-of-sight from the antenna to the satellite, therefore the antenna/converter unit must be installed in a location with an unobstructed view of the sky. Very good reception is possible when the antenna has a free view of 8° angular elevation above horizon.

The parameters for the GPS clock can be set up by **GPSMON32** software (see www.meinberg.de) via the serial port COM 0 (RS232 at the front of the GPS clock; use a cross over cable). The port COM 1 is connected to the DataFW4 CPU1 (internal interface).

The correct parameter (see menu "Outputs – Serial Parameter) are:

- COM 0: 19200, 8N1, Meinberg Standard, per second
- COM 1: 9600, 7E2, Meinberg Standard, per second

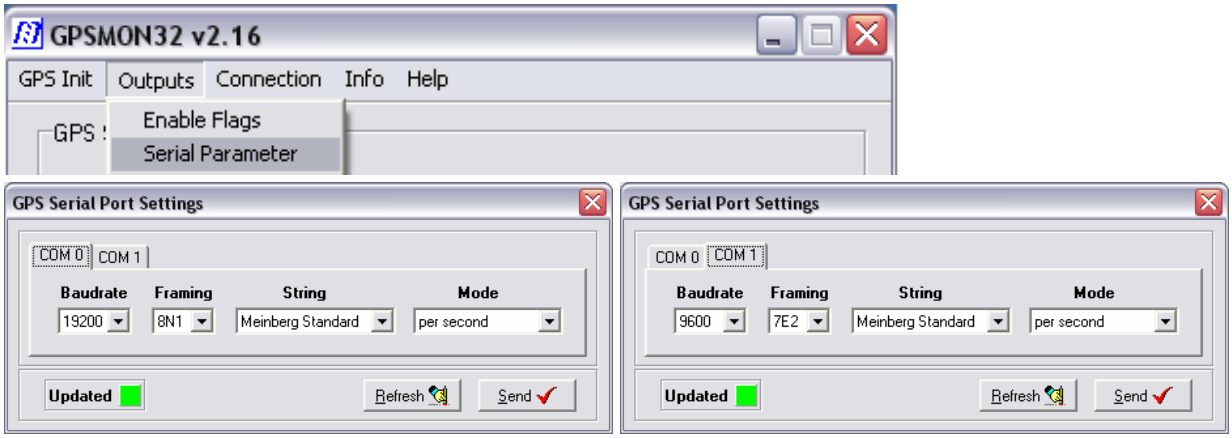


Figure 17, GPS settings

In the menu “GPS Init – Set Timezone” you can set the correct time zone (button “Send”):

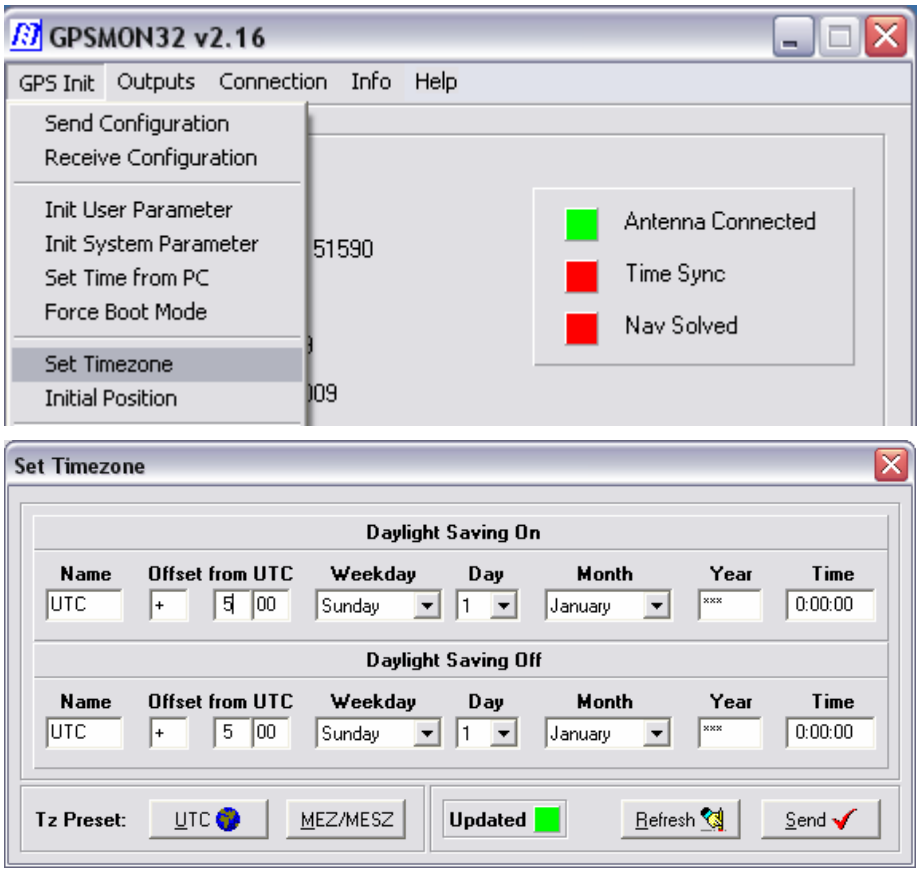
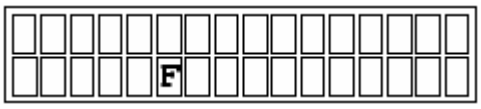


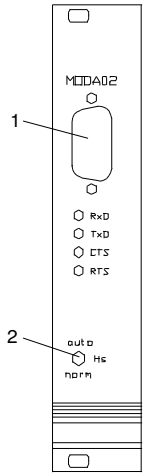
Figure 18, GPS Timezone

GPS clock reception can be enabled and disabled via the keypad, the parameterization software DMFPARA or SCTM protocol. If it is enabled, an "**F**" appears in the middle of the second line of the display next to the current minute. If it is disabled this character is not displayed.



The GPS clock is read out once a minute and controls the system time of the DataFW4. If the radio pulses fail for more than 24 hours, an alarm to this effect is shown on the display.
If DataFW4 is activated but the GPS clock does not receive data, the internal real-time clock must be set by hand. As soon as the GPS clock receives correct data, the internal clock is corrected.

2.10 MODA02 interface board



1: RS232 (V.24) interface
Read out of data

2: Handshake
automatic / normal

Figure 19, Moda02 interface board

The MODA02 has a RS232 interface with which maximum demand and energy values buffered in the data memory can be read out directly.

A special connecting cable is required to read out the data. It can be ordered separately.

With the switch on the front panel the module can be switched between 2 handshake modes.

The 2 different handshake modes support both PCs with handshaking and PCs without handshaking:

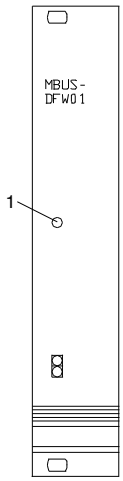
- Handshake automatic (switch setting: `auto`). The internal signals RTS and CTS are short-circuited such that data transmission is only possible if the connected PC does not support handshaking.
- Handshake normal (switch setting: `norm`)

The PC supports the usual RTS/CTS handshake. This mode ensures greater data transmission reliability.

Example for connection between MODA02 and PC (pin assignment of the RS232/V.24 interface):

MODA02 (9 pins)			**PC (9 pins)**		
Input/Output	**Pin No.**		**Pin No.**	**Input/Output**	**Additional information**
Input	**2**	——	**3**	Output	TxD (Transmit data)
Output	**3**	——	**2**	Input	RxD (Receive data)
	5	——	**5**		GND (Signal-Ground)
Output	**7**	——	**8**	Input	CTS (Clear to send)
Input	**8**	——	**7**	Output	RTS (Request to send)

2.11 M-Bus adapter board MBUS-DFW01



1: LED

Figure 20, M-Bus adapter board MBUS-DFW01

The M-Bus adapter board allows the DataFW4 to be connected to the M-Bus system. The M-Bus master permits connection of up to 250 devices consisting of any combination of DataFW4 and M-Bus devices. The data transmission protocol of the DataFW4 equipment can be the SCTM format or the LSV1 procedure. The green LED on the front panel indicates that data is being transmitted via the M-Bus when it lights up.

The M-Bus system is a powerful bus system for transmitting data. Central remote interrogation of different equipment is possible with connection to this bus system. For further information see the separate description of the M-Bus system.

Example of M-Bus configuration:

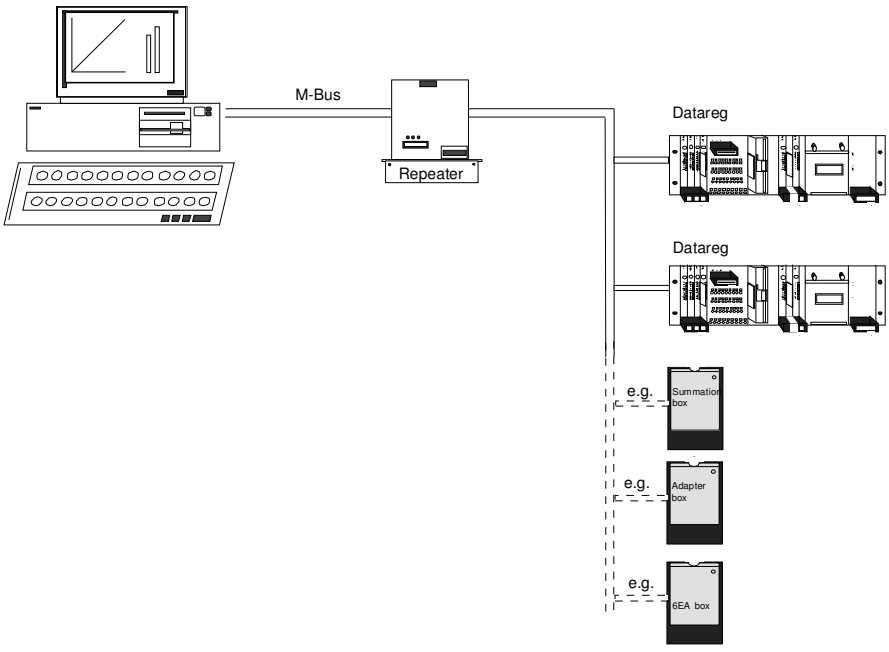


Figure 21, M-Bus system

3 Installation and Commissioning

3.1 Scope on delivery

MemoryCard unit MSC01: Does not have memory card inserted

Lithium batteries: Inserted

Power supply: Customer-specific

! DataFW4 is not parameterized.

3.2 Default setting on restart

The table below shows the most important device parameters on a restart:

Device parameters	Defaults
Date	Thursday, 1st January 2004
Time	00:00:00
Equipment identifier (ID)	0000000000000000
Channel number	as ordered (none active)
Number of summation registers	as ordered
Summation balance	off
Operating mode	4 energy tariffs, 4 maximum demand tariffs
Pulse ratios	1:1 for all registers (energy and demand)
Register readings	not active; activation via DMFPARA or keypad
Summation registers	not active
Number of resets	0
Integration period duration	15 minutes
Starting time	none
Printer	active (if supplied)
Baud rate for SCTM	2400 baud
Cyclic buffers	not assigned
Pulse duration for inputs	at least 30 ms pulse length
	at least 30 ms pulse interval
Output pulses	90 ms pulse length
	110 ms pulse interval
Control inputs	not active
Summer time switchover	off
Tariff rate calendar	inactive
Radio clock	off
Password	12345
Language	English

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3.3 Installation of the device

3.3.1 Connection

Remove transport securing devices!

Check that batteries are inserted in the CPU and the main memory unit VU26 and that the battery jumpers are set correctly. For instructions see Section 3.4. Data media are not inserted. Before commissioning the equipment all the electrical connections must be made as described in Appendix D or according to any special connection diagram(s) supplied.

! For technical reasons only the meter data of the first 32 inputs can be stored in the demand profile memories (cyclic buffers) in DataFW4 equipment. For this reason make sure that meters required for billing purposes are routed to inputs 1 to 32.

3.3.2 Installation procedure

On initial startup, the DataFW4 must be parameterized with the basic data.

Please follow the following steps:

1. Remove transport securing devices.
2. Install the DataFW4 at the metering location as shown in the installation drawing.
3. Make the electrical connections as shown in the enclosed terminal connection diagram.
4. Remove any transport securing devices and insert the battery if necessary (see Section 3.4).
5. Now switch on the power supply.
6. Call up the menu item RESTART (Factory settings). This ensures that all buffers are cleared and all registers reset to "0" or the default settings.
7. Parameterize the DataFW4 with the parameterization program DMFPARA via the Service interface or the keypad as described in Section 4; (individually activate all the channels you require using the parameterization software DMFPARA or via the keypad!).
8. Set the starting time.
9. Set the program protection switch (if necessary).
10. Exit the parameterization program.
11. Metering begins automatically at the preset time.

! Activate the pulse inputs (see Section 4.4.2.15)!

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3.3.3 Transport and subsequent commissioning

It is possible to install a previously parameterized unit at a new measuring location without having to reparameterize it.

The following procedure applies:

- The previous data must be **cleared**:
  Perform a RESTART with the aid of the parameterization program DMFPARA or via the keypad. After this reparameterization is required.
- The previous data must be **retained**:
  Disconnect the terminals.
- Transport the DataFW4 only in the specially designed packaging.
- Install the DataFW4 at the new measuring location as shown in the installation diagram.
- Make the connections as shown in the terminal connection diagram.
- Remove the transport securing devices again.
- Switch on the power supply.
- The standard display appears on the display. In the lower line of the display the "FAULT PRESENT: " character appears for power failure and the red LED A1 will blink at the same time. Reset all alarms with the menu item "DELETE ERRORS" before starting measurement.
- If a starting time has not yet been set, set a new starting time.
- Metering automatically begins at the preset time.

3.4 Battery replacement

The batteries of the DataFW4 must be inserted before startup! After startup the battery must only be changed while the unit is switched on to prevent loss of data. Avoid touching live parts inside the unit. The battery must not be held with metal tweezers or similar tools!

Order number for **lithium battery**:

Unit	Order no.	Description
Main unit CPU1, VU26 unit	**#5356 (BÄR-Type 2450)**	Lithium battery LM2450 (plus pole outside), CR2450 or CR2450N
MemoryCard	**see memory card**	Lithium battery for memory card

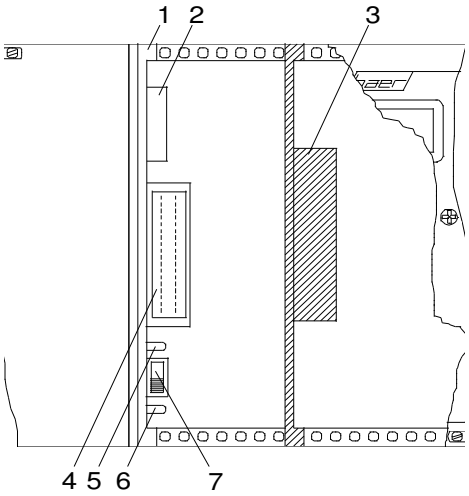
A lithium battery (#5356) has a life of approx. 10 years.

3.4.1 Main unit CPU1

Unscrew the four screws of the keypad and remove the keypad from the DataFW4 (see Figure 22 and 23). Touch the metal frame of the unit briefly with your hand to equalize the potential. After this remove the battery from the battery holder carefully and insert the new battery! Pay attention to the position of the poles (the plus pole ⊕ must point away from the board)!

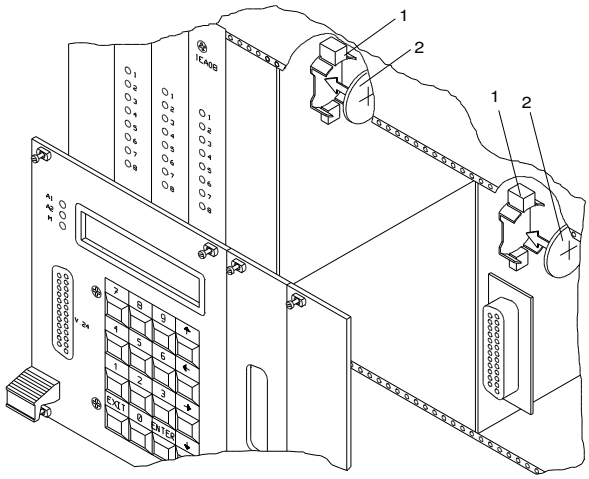
3.4.2 VU26 unit

Remove the two screws on the front panel of the VU26 (see Figure 23) and remove the front panel of the VU26 carefully. Touch the metal frame of the unit briefly with your hand to equalize the potential. You also have to unscrew the keypad to the right of the VU26. After this remove the battery from the battery holder carefully. The new battery must now be placed in the battery holder. Make sure the polarity of the battery is correct (the plus pole ⊕ must point away from the board)!



1: Board
2: Battery holder
3: **Live parts!**
4: Connector
5: Red LED
6: Yellow LED
7: Program protection switch

Figure 22, Live parts! Caution when replacing the battery!



1: Battery holder
2: Battery

Figure 23, Battery holder with battery

3.4.3 MemoryCard

Because the SRAM in the memory card is a volatile memory, it requires a power supply so that no data is lost when the system power supply is switched off.

For more information see the label on the MemoryCard.

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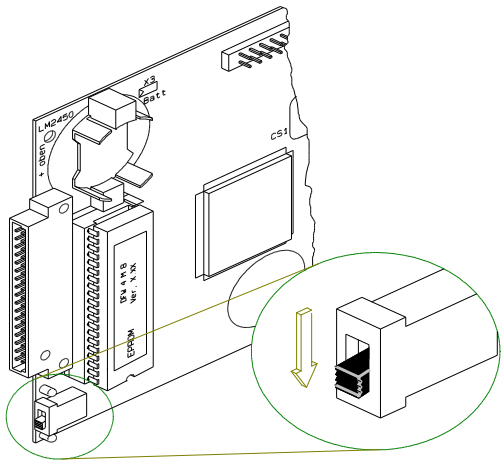
3.5 Program protection switch

Before transferring any parameters to the DataFW4 unit, the program protection switch must be set to “Enable” (switch down). The program protection switch is located on the underside of the display board of the DataFW4.



1 Battery holder
2 Red LED
3 Yellow LED
4 Program protection switch
5 EPROM

Figure 24, Program protection switch

! Always touch first the grounded (earthed) metal frame of the unit with one hand to force equalization of voltage potentials. Avoid any contact with other possibly charged parts of the data logger unit when changing the setting of the program protection switch!

3.5.1 Open the main unit

To achieve access to this switch, the front panel of the main unit (CPU1) must be unscrewed and take off. The program protection switch is located in the lower hand corner of the CPU1 and can be operated by hand.

3.5.2 Set the program protection switch

The meaning of the position is:

- Switch down (enable): Setting of parameters is permitted, red LED is off.
- Switch up (disable): Setting of parameters is disabled, red LED is on

To refuse access to parameter settings to unauthorized persons, the front panel should be sealed.

4 Operation

Depending on the equipment ordered (varying software options or hardware components), the following description may be too comprehensive.

4.1 Standard display

The LC display allows the user to call up status and system information such as buffer and register contents. After turning on the equipment, the following text appears in the display (the so-called permanent display)

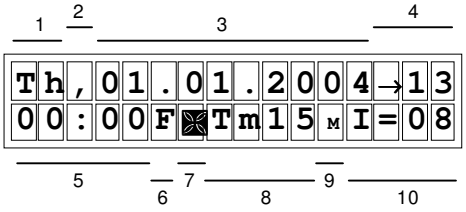
```
Th 01.01.2004
00:00  Tm=15 K=08
```

or

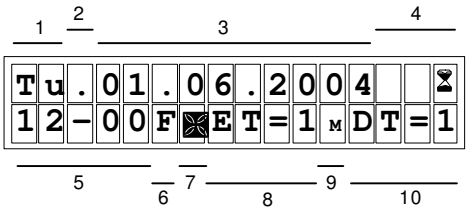
```
Th 01.01.2004
00:00  ET=1 DT=1
```

Tm: Duration of measuring period in minutes
K: Number of channels set (inputs)
ET: Energy tariff
DT: Maximum demand tariff

The first line displays the date as weekday, day, month and year.
In the second line, the left 5 places represent the time of day. In the 6th place, the character „**F**“ - for radio-controlled clock (GPS) - may appear. The sign for „error present“ is in the 7th place.
These are followed by the measuring period durations (Tm=) in minutes and the number of Inputs set (I=) which alternate with the energy tariff (ET) and maximum (demand) tariff (DT) presently in use. Between ET and DT, the character „**M**“ designates that maximum measurement is in progress (but only when the measurement was previously started).



1 Day of the week
2 Winter time (,)
3 Date
4 Integration period status
5 current time/system time (:)
6 Radio clock reception
7 Fault present
8 Period length in minutes
9 Maximum demand measurement active
10 Number of channels



1 Day of the week
2 Summer time (.)
3 Date
4 Integration period status
5 Start of measurement (-)
6 Radio clock reception
7 Fault present
8 Energy tariff
9 Maximum demand measurement active
10 Maximum demand tariff

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The characters in the 6th place:

	No radio clock (GPS), radio clock (GPS) not active
F	Radio clock (GPS) active
□	Radio clock (GPS) idling
!	Difference between radio clock (GPS) time and equipment time > 1 day, time is not accepted
#	No internal synchronization
?	Error in radio clock telegram

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The following table shows the displays that are possible in the areas 1 to 10:

Area	Information	Display	Explanation
1	Day of the week	Mo, Tu, We, Th, Fr, Sa, Su	
2	Summer time/ winter time	. , without	Summer time, winter time Summer/ winter time switchover not active
3	Date display	DD.MM.YYYY	Day. Month. Year
4	Integration period status	⧗ →13 !12 without	Starting time for measurement is set Minutes until the end of the current integration period Recording interruption, minutes until the end of the integration period Measurement not active
5	Time or starting time	00:00 00-00	Current time/ system time Start of measurement set
6	Radio clock (GPS)	no display F □ ! # ?	no radio clock, radio clock not active Radio clock active Radio clock idling Difference between radio clock time and equipment time > 1 day, time is not accepted No internal synchronization Error in radio clock telegram
7	Alarm	⧗	System error
8	Integration period duration or current energy tariff rate	Tm ET	Time in minutes (01 to 60) Energy tariff rates 1 to 4
9	ABL display	M	Maximum demand measurement active
10	Number of channels or current maximum/ demand tariff rate	I DT	Number of active inputs (channels: 01 to 48) Maximum demand tariff 1 to 4

If a starting time has been programmed, the selected starting time will alternate with the actual time in the permanent display. To differentiate between the two, a dash (-) is used to separate the hours from minutes in the starting time.
Furthermore, a stylized hour glass („egg-timer“) on the right edge of the first line symbolizes that a starting time has been set. In this case, the green LED on the left side of the display will blink. When the selected starting time has been reached, a small arrow will appear at the same position instead of the hour glass, with the remaining time in minutes until the end of the this measuring period. In this case, the green LED emitting diode is continuously lit (i.e. the green LED at the left side of the display)

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Possible actions in the standard display:

Enter		Shows errors
Cursor-Down		Main menu
Cursor-Right		Language selection
0-Taste		ROLL display
Cursor-Up		Main menu

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4.2 Menu structure

From the standard display you can branch to the various program displays by pressing key combinations.

The following table explains the menu structure from the standard display. You return to the standard display automatically or when you prematurely cancel a function (by pressing the EXIT key several times).

Key	Display	Explanation
Enter 	Fault display	System fault Memory fault Program fault
Cursor-Down 	Main menu	Info: inputs Set parameter (parameterization): password-protected Recording break (interruption): password-protected Maintenance Print Delete errors (faults) Periodic buffers Register address
Cursor-Right 	Language selection	The "CURSOR-RIGHT" key is used to select the language menu directly. German, English, French and Dutch are available. The default setting is English
0-Taste 	ROLL display	The "0" key simulates the external ROLL (ANZ) control input and allows you to scan the ROLL menu (ANZ must be parameterized and activated)
Cursor-Up 	Main menu	Register address

During programming, the individual values are entered via the numeric keys. These values are saved with the ENTER key. Pressing the EXIT key quits a menu item without saving.

Exception: Only integer divisors of 60 are allowed for the length of a measuring period. You can search for the next larger or next smaller measuring period length with the CURSOR-RIGHT and CURSOR-LEFT keys until the desired value appears in the display. It will be accepted by pressing the ENTER key. The value set appears in the standard display at „Tm=..“ The Baud rate is set in the same manner.

4.3 Fault display

This function displays all faults that have occurred and have not been reset yet on the display. A distinction is made between:

- **Warnings**: memory faults and system faults (W, LED A1)
- **Critical errors**: hardware errors (F / CE, LED A2)

LEDs A1 and A2 on the front panel of the CPU display faults in the system. Alarms generally have to be acknowledged, i.e. the LEDs continue to flash even though the faults have already been remedied (e.g. power failure). Only after all alarms have been acknowledged with the menu item "DELETE ERRORS", do the LEDs go out.

Class	Display	Explanation
	System faults: The following system and printer faults can be displayed:	
W	Power failure !	INFO; Clear alarm!
W	Power failure in current Tm	Power failure during recording. The current measuring period is marked accordingly; Clear alarm!
W	Display/Keyboard no input !	Defective or no display/keypad on the CPU. Check connection, replace if necessary!
W	No Data from DCF Radio Clock	The radio clock has not sent the time to the CPU for 24 hours. Check reception/antenna!
W	Printer failure	The protocol printer has failed. Check!
W	Printer:No paper	Printer paper finished. Insert new paper roll!
W	Printer: Buffer Overflow	Overflow in the internal printer buffer. Data loss!
W	SYNC: Out of window !	Synchronization signal outside the permitted range. Check time!
W	CALEC: No data !	No data from CALEC. Check connection, replace if necessary!
F / CE	EPROM-Checksum wrong !	CPU EPROM defective. Replace!
F / CE	RAM Error	Fault in the internal CPU RAM. Replace CPU!
F / CE	FC/MSC Error: Communication !	Transmission error between CPU and RAM. Check device!
F / CE	FC/MSC Error: Hardware !	Hardware fault in the memory-RAM. Replace slot-in module!
	Memory faults: Memory faults indicate faults in the RAM and communication module. On the left-hand side of the first line the type of module is displayed and on the second line the fault.	
W	FC01a Medium 95% full	Diskette 95% full. Replace diskette!
W	FC01a Medium full	Diskette 100% full. Replace diskette immediately! Data loss!
W	MSC01a MemCard Battery empty	MemCard battery flat. Replace battery immediately!
W	MSC01a MemCard Battery damaged	MemCard supply switched over to stand-by battery. Replace battery immediately!

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Class	Display	Explanation
W	MSC01a MemCard not formatted	MemCard not formatted or not correctly inserted. Format, check insertion, replace if necessary!
W	..... No Medium	No MemCard/diskette inserted. Insert!
W	..... Write protected	MemCard is write-protected. Deactivate write protection!
W	..... Wrong Format	MemCard not formatted or not correctly inserted. Format, check insertion, replace if necessary!
W	..... Write Error	Error on writing the data to the MemCard. MemCard defective, replace!
W	..... Read Error	Error on reading data from the MemCard. MemCard defective, replace!
F / CE	..... RAM/Timer Error!	RAM or timer defective. Replace slot in module!
F / CE	..... Hardware Error !	Hardware fault in the memory-RAM. Replace slot-in module!
F / CE	..... Buffer overflow!	Overflow of the internal memory. Not all data were stored correctly. Check and replace if necessary!
	Puls faults:	
W	Energy Inp. xx Overflow	Energy register overflow for channel (input) xx Check parameterization!
W	Energy Sum xx Overflow	Energy register overflow for sum xx Check parameterization!
W	MD Input xx Owerflow	Demand register overflow for channel (input) xx Check parameterization!
W	MD Sum xx Overflow	Demand register overflow for sum xx Check parameterization!
W	Pulse Output xx Overflow	Pulse output overflow for output xx. The pulse output is displayed for which this fault was set first. Check parameterization!

4.3.1 Calling up the fault display

The starting point is the standard display. Press the ENTER key call up the "FAULT DISPLAY" menu and the display switches over.

Explanation: Fault display menu

Key:			
	Cursor-Up	↑	Scroll through the fault display menu
	Cursor-Down	↓	Scroll through the fault display menu
	Enter	ENTER	Scroll through the fault display menu
	Exit	EXIT	Return to the initial display

4.3.2 LED display on CPU

LEDs A1 (warnings) and A2 (critical errors) on the front panel of the CPU displays faults in the system. Alarms generally have to be acknowledged, i.e. the LEDs continue to flash even though the faults have already been remedied (e.g. power failure). Only after all alarms have been acknowledged with the menu item CLEAR ALARMS, do the LEDs go out.

4.4 Main Menu

From the standard display you can branch to the various program displays by pressing key combinations. If you press the CURSOR-DOWN key the first item of the main menu is called up. If you press the CURSOR-DOWN key repeatedly you can page through the main menu step by step.

Explanation: You can select from eight submenus

Key:			
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Enter	ENTER	With the ENTER key you can branch to a menu item.
	Exit	EXIT	With the EXIT key you can exit the menu item.

Info: Inputs

In menu INFO: INPUTS you can call up the following memory contents and measured value results: energy and demand meter readings for inputs and sums, pulse ratios of the energy and demand meters, maximum demands, reset lists (RST lists) for inputs and sums, storage medium, power factor (cos φ), number of resets, equipment designation.

Set parameters

Set the parameter: this is for setting the equipment's basic programmed after entering the valid password! Confirm this max. 8 position code with the ENTER key.

Recording break

Recording interruption: this item is used to interrupt to change a diskette or replace paper in the printer (possible only after entering the password), or to terminate recording

Maintenance

Formatting of memory card and display test

Print

Printed out: direct print out of one of the following lists: List 1, List 2, Reset List, (with selection of a reset number) and Parameter List.

Delete errors

Clearing alarms: errors (list from the error display) are corrected by the operator and the „error present“ sign (⊠) is cancelled, which switches off the error message relay.

Periodic buffer

Call up the cyclic (periodic) buffers (CB01/PP-01 or CB02/PP-02).

Register address

Call up all addresses from internal memory

4.4.1 Information (Info: Inputs)

Explanation: In menu INFO: INPUTS you can call up the following memory contents and measured value results: energy and demand meter readings for inputs and sums, pulse ratios of the energy and demand meters, maximum demands, reset lists (RST lists) for inputs and sums, storage medium, power factor (cos φ), number of resets, equipment designation.

Key:			
	Enter	ENTER	Call up of the info menu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

The following applies for all submenus items:

Explanation: Information on current (continuously updated) contents

Key:			
	Enter	ENTER	The next higher input number
	Cursor-Up	↑	The next lower input number
	Cursor-Down	↓	The next higher input number
	Exit	EXIT	Leanes the submenu item

In submenu items, you can jump from lower or higher input numbers with the CURSOR-UP and –DOWN keys.

4.4.1.1 Counter value

Explanation: the menu COUNTER VALUE shows the following memory contents and measured value results.
An active channel is marked in the second line with a „#“. Only activated channels count pulses!

Key:			
	Enter	ENTER	Call up of the counter value: demand meters, energy cumulative (total), energy cumulative (tariff), energy meter current (total), energy meter current (tariff)
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Cursor-Right	→	in menu item tariff: scroll to the next tariff rate
	Cursor-Left	←	in menu item tariff: scroll to the previous tariff rate
	Exit	EXIT	Return to the higher-level menu

energy cumulative: total amount of energy metered from day one up till now
energy current: energy consumed since the last reset

4.4.1.2 Summation registers (SUM)

Explanation: the menu SUMS displays the following memory contents and measured value results.

Key:			
	Enter	ENTER	Call up of the summation register: demand summation, energy cumulative (total), energy cumulative (tariff), energy meter current (total), energy meter current (tariff)
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Cursor-Right	→	in menu item tariff: scroll to the next tariff rate
	Cursor-Left	←	in menu item tariff: scroll to the previous tariff rate
	Exit	EXIT	Return to the higher-level menu

energy cumulative: total amount of energy metered from day one up till now
energy current: energy consumed since the last reset

4.4.1.3 Pulse ratio

Explanation: the menu PULSE RATIO displays the numerator and denominator of the pulse ratio of the energy and demand meters.

Key:			
	Enter	ENTER	Call up the PULSE RATIO menu: demand meters, energy meters
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.1.4 Maximum demand (inputs/channels INP)

Explanation: the MD MAXIMUMS INP submenu displays the maxima with date and time of the demand meters for all tariff rates. The content is constantly up-dated.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.1.5 Maximum demand (summation register SUM)

Explanation: the MD MAXIMUMS SUM submenu displays the maxima with date and time of the summation register for all tariff rates. The content is constantly up-dated.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

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4.4.1.6 Reset list (inputs/channels INP)

Explanation: the RST-LIST INP submenu displays the reset list of inputs (maxima with date and time, energy cumulative, energy current).

Key:	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Select the reset list (01-12)
	Cursor-Down	↓	Select the reset list (01-12)
	Enter	ENTER	Call up the reset list (01-12)
	Cursor-Up	↑	Select the list item: energy cumulative, energy current, maximum demand, power factor
	Cursor-Down	↓	Select the list item: energy cumulative, energy current, maximum demand, power factor
	Enter	ENTER	Call up the list item
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.1.7 Reset list (summation register SUM)

Explanation: the RST-LIST SUM submenu displays the reset list of summation register (maxima with date and time, energy cumulative, energy current).

Key:	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Select the reset list (01-12)
	Cursor-Down	↓	Select the reset list (01-12)
	Enter	ENTER	Call up the reset list (01-12)
	Cursor-Up	↑	Select the list item: energy cumulative, energy current, maximum demand, power factor
	Cursor-Down	↓	Select the list item: energy cumulative, energy current, maximum demand, power factor
	Enter	ENTER	Call up the list item
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.1.8 Storage medium

Explanation: If data media (diskettes or memory cards) are used, the free memory capacity (%) is displayed.

Key:	Enter	ENTER	Call up the submenu item
	Exit	EXIT	Return to the higher-level menu

If a diskette is full (00 % free), no more data are stored!
If a memory card is full it goes in the circulating buffer mode and the oldest entries are overwritten!

4.4.1.9 Cos (PHI)

Explanation: the "Cos (hi)" submenu displays power factor.

Key:			
	Enter	ENTER	Call up the submenu item "Cos (phi)": W = current power factor: integration time from DMFPARA (1-60min.) Tm = power factor of the entire measuring period Tm
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.1.10 Number of resets

Explanation: the number of resets is displayed.

Key:			
	Cursor-Up	↑	Call up "Cos (phi)"
	Cursor-Down	↓	call up "Version designation CPU"
	Exit	EXIT	Return to the higher-level menu

Call up the menu item: NO. OF RESETS xx/yy MM-DD -ss:mm (time)
xx: Reset number (can be parameterized between 01 and 12)
yy: System reset number (between 00 and 99, not parameterizable)

4.4.1.11 Version designation

Explanation: the version of CPU and memory unit is displayed: version number (V.X.YY), internal device designation (article number), checksum (EPROM: BCC)

Key:			
	Enter	ENTER	Call up the menu item "Version of memory unit"
	Exit	EXIT	Return to the higher-level menu

If you contact the manufacturer for any reason, please give this information

4.4.2 Parameterization via the keypad

The DataFW4 must only be parameterized while measurement is not being performed. Some settings are disabled while measurement is running, others can be performed but cause problems for the evaluation of data obtained during this integration period.
Complex functions such as tariff rate calendar, summer/winter time switchover, printer texts and power factor can only be parameterized using the DMFPARA parameterization software.
The PARAMETERIZATION menu is password-protected. However, if no password has been installed, you can skip the prompt for the password by pressing the ENTER key again. If a password is installed and is entered incorrectly you return to the menu item PARAMETERIZATION automatically and can call up the function again.

Parameterization menu:

Menu item	Status	Explanation
Restart system	**P★**	While measurement is not in progress: Restart causes all parameters to be reset to the default setting (factory settings). All memories and the clock are reset.
Printer mode	**S**	Setting the printer
Baud rate	**S**	Setting the transmission rate
Date	**S**	Setting the date
Time	**S**	Setting the actual time
Radio clock	**S**	Setting the radio clock
Summer time	**S**	Setting the summer time
SYNC input	**S**	Setting the SYNC input
Unit identifier	**S**	Setting the device identification
Station address	**S**	Setting the station address (DIN 19244)
Number of inputs	**P★**	Setting the number of channels
Number of sums	**P★**	Setting the number of summation registers
Number of tariffs	**P★**	Setting the number of tariffs
Input quantization	**P**	Setting the "pulse ratio"
Counter value	**S**	Setting the initial values of the energy meters
Sums registers	**P**	Setting the "pulse ratio" for summation and the initial values of the energy summation register
Max. resets	**S**	Setting the reset number
Periodic buffers (INP)	**P★**	Configure the cyclic (periodic) buffers for inputs
Periodic buffers (SUM)	**P★**	Configure the cyclic (periodic) buffers for summation registers
Measuring period	**P★**	Setting the measuring period
Starting time	**P★**	Setting the starting time

★: cannot be changed while measurement is in progress. If you want to change these values, you must end recording. A change of the other menu items is possible but may cause considerable problems for subsequent evaluation software because the changes are not flagged

P: Parameterization (only in Germany PTB-Version)

S: Setting

Key:			
	Enter	ENTER	Call up of the SET PARAMETERS menu
	Digits (0 - 9)		Input of the password for "parameterization" (up to 8 digits)
	Enter	ENTER	Confirm password

Cursor-Up	↑	Scrolling
Cursor-Down	↓	Scrolling
Exit	EXIT	Return to the higher-level menu

Before you are allowed entry into this part of the program, the user must enter a password. It can be a maximum of 8 places and is confirmed with the ENTER key. If a password has not been installed, you can enter the program item SET PARAMETERS by pressing the ENTER key. If the correct password was entered, the parameters listed below can be changed. If an incorrect password has been entered (message: INCORRECT), the user will be returned to the program item SET PARAMETERS.

When selecting a submenu, the entry program runs as follows:

- The default value appears either as the old value, or an internal default, e.g. with a new start.
- The entry of a number at the cursor position is executed with the NUMERIC keys. The cursor automatically moves one place to the right.
- Characters that have been entered can be deleted with the CURSOR-LEFT key.
- Channels or summation registers respectively are selected with the CURSOR-UP and CURSOR-DOWN keys.
- An entry is accepted by pressing the ENTER key. If you press the EXIT key instead, the old value will not be changed and the next higher level menu item will be displayed.
- In case the entry program functions in a different manner, this will be stated in the respective submenu item.

4.4.2.1 Restart (Factory settings)

Explanation: The RESTART menu can only be selected if measurement is not being performed. If measurement is in progress this menu item is skipped. The RESTART function is password-protected and causes all parameters to be reset to the default setting. All memories and the clock are reset. If you press the EXIT key you can skip the menu item RESTART.

Key:	Enter	ENTER	Call up the menu RESTART
	Digits (0-9)		Input of the password for "restart system"
	Exit	EXIT	Do **not** clear memories

```
RESTART SYSTEM ?
ENTER=Y   EXIT=N
```

If you press the ENTER key:

```
Restart Password
```

If the correct password has been entered:

```
Are you sure ?
ENTER=Y   EXIT=N
```

If you press the ENTER key: restart is performed, all memories are cleared and the system is restarted.

4.4.2.2 Printer mode

Explanation: The PRINTER MODE submenu is used to set the printer. Printer settings are shown in the second line of display. If no printer is installed the message "not active" appears on the display

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

PRINTER ON/OFF In the first submenu the printer is switched on or off.

Key 0 OFF: The printer is switched off and no further submenus will be called.

Key 1 ON: The printer is switched on and four further submenus will be called.

PRINT VALUES In this submenu you have two options (the printer must have been activated first):

Key 1 All maximum demand average values (reading of individual meter inputs at the end of each measuring period) and all maximum demand summation registers will be printed at the end of each measuring period (Display: PRINT VALUES (1)).

Key 0 Only the summation register readings will be printed (Display: PRINT VALUES (0)), afterwards you are taken to submenu PRINT LIST 1

LIST 1: The time at which lists 1 and 2 and the reset list are printed is defined via the keypad. The scope and content of the individual lists can be parameterized with the parameterization software DMFPARA.
no list (print off): do not print
daily: at 00:00
monthly: on the first of each month at 00:00
Tm-End: at the end of each measuring period
Maximum Reset: after every successful reset

LIST 2: see LIST 1

RST-LIST: see LIST 1

4.4.2.3 Baud rate

Explanation: The baud rate determines the transmission rate of the SCTM/LSV1/IEC60870 or DIN19244 protocol in full duplex mode. The permissible baud rates are: 300, 600, 1200, 2400, 4800 and 9600.

Key:			
	Enter	ENTER	Call up the submenu PER. BUFFER (SCTM/LSV1/IEC60870)
	Cursor-Right	→	Scrolling
	Cursor-Left	←	Scrolling
	Enter	ENTER	Call up the submenu LOAD CONTROL (DIN19244-30sec or IEC60870-1min) for load check
	Exit	EXIT	Return to the higher-level menu

You move to the next larger or next smaller Baud rate with the CURSOR-LEFT and CURSOR-RIGHT keys until you have the desired value. This is accepted by pressing the ENTER key. By pressing the CURSOR-UP key, the old value that was set will appear.

The modem must be set to the same operating mode and baud rate (see Section 2.7 Modem)!

4.4.2.4 Date

Explanation: Setting the date of the internal real-time clock. Here the current settings for the day, month and year are displayed one after the other. Each of these can be overwritten. You can exit the date setting with EXIT and the clock is set to the previous setting

Key:			
	Enter	ENTER	Call up the submenu
	Exit	EXIT	Return to the higher-level menu

Submenus: DAY (1-31), MONTH (1-12), YAER (1980-2400)

Normal input mode is used for this menu item. Submenu items are shown successively with the current setting. This will be accepted by pressing the ENTER key.

A new date can be entered with the NUMERIC keys.

After you have pressed the ENTER key, a limit check will be executed and if necessary, you may be requested to reenter the date.

If you press the EXIT key, the date in this submenu item will not be changed.

4.4.2.5 Time

Explanation: Setting the actual time of day. The time is set in the sequence hours, minutes. The seconds are automatically set to zero. If you cancel the entry prematurely the time is reset to the previous value

Key:			
	Enter	ENTER	Call up the submenu
	Exit	EXIT	Return to the higher-level menu

Submenus: HOURS, MINUTES

The device asks for the hours first, then the minutes. By pressing the ENTER key, the seconds are set to 0.

Normal input mode is used for this menu item.

NOTE: If the equipment is equipped with a radio clock, this menu item does not have an effect unless the radio-controlled clock malfunctions

4.4.2.6 Radio clock (for Germany only) or GPS

Explanation: This menu item activates and deactivates the radio clock or GPS scan of the CPU

Key:			
	Enter	ENTER	Call up the submenu
	Key 1		Activate: ON
	Key 0		Deactivate: OFF
	Exit	EXIT	Return to the higher-level menu

4.4.2.7 Summer time

Explanation: This menu item activates and deactivates summer time (daylight saving time)

Key:			
	Enter	ENTER	Call up the submenu
	Key 1		Activate: ON
	Key 0		Deactivate: OFF
	Exit	EXIT	Return to the higher-level menu

4.4.2.8 SYNC input

Explanation: This menu item activates and deactivates the SYNC input (if radio clock is off)

Key:			
	Enter	ENTER	Call up the submenu
	Key 1		Activate: ON
	Key 0		Deactivate: OFF
	Exit	EXIT	Return to the higher-level menu

4.4.2.9 Unit identifier (ID)

Explanation: The unit identifier (equipment identification) is entered via this menu item

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-9)		Enter the 16 figure unit ID (identifier)
	Exit	EXIT	Return to the higher-level menu

4.4.2.10 Station address

Explanation: Via this menu item you can enter the station address for the RS232 interface for 30 sec. (DIN19244) or 1 min. (IEC 60870) load check. The address"0" deactivates the interface

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-9)		Enter the station address (1 - 255)
	Exit	EXIT	Return to the higher-level menu

4.4.2.11 Number of inputs

Explanation: Via this menu item you can enter the maximum number of inputs (channels). The channels must then be activated via the menu COUNTER VALUE (mark #). While measurement is in progress this menu item is disabled because reducing the number of channels also resets the cyclic buffers.

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-9)		Enter the number of channels (1 - 48)
	Exit	EXIT	Return to the higher-level menu

4.4.2.12 Number of summation registers

Explanation: With this menu item you can set the maximum number of active summation registers. The summation registers must then be activated via the menu SUMS REGISTERS. While measurement is in progress this menu item is disabled because **reducing** the number of summation registers also simultaneously resets the cyclic buffers. If the sum balance calculation is activated or deactivated the buffer assignment is also reset.

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-9)		Enter the number of summation registers (0 - 8)
	Exit	EXIT	Return to the higher-level menu

4.4.2.13 Number of tariffs

Explanation: Via this menu item you can set the maximum number of active energy and demand tariff rates. The maximum number of tariff rates must not be exceeded

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-4)		Enter the number of tariffs (0 - 4)
	Cursor-Up	↑	Switch between energy and maximum tariff rates
	Cursor-Down	↓	Switch between energy and maximum tariff rates
	Exit	EXIT	Return to the higher-level menu

Submenus: Energy tariff, Maximum tariff

4.4.2.14 Input quantization

Explanation: In the INPUT QUANTIZATION (pulse ratios) submenu you can set the numerator and the denominator values for the energy and demand meters. Some examples of this are calculated in "Section 5 Setting the pulse ratios". Pulse ratios that are larger than 1:1 must be avoided because they impair the resolution (conversion to "fast").

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Switch between energy counter and MD counter
	Cursor-Down	↓	Switch between energy counter and MD counter
	Exit	EXIT	Return to the higher-level menu

- **Pulse ratio MD counter**

  Explanation: Setting numerator and denominator values of pulse ratios for maximum demand meters.

Key:			
	Enter	ENTER	Call up the submenu MD COUNTER
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

  Normal input mode is used for this menu item.

  The numerator value will be asked for first. After pressing the ENTER key, you must enter the denominator value for the same input. If you only want to change the denominator value of the pulse ratio, you must press the ENTER key when asked for the numerator which then transfer you to the denominator value item.

  With EXIT you will be returned to the submenu: Energy meter (pulse ratios). You can quickly change the channel number with the CURSOR-UP and CURSOR-DOWN keys.

- **Pulse ratio energy counter**
  see "Pulse ratio MD counter"

Key:	Enter	ENTER	Call up the submenu ENERGY COUNTER
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Exit	EXIT	Return to the higher-level menu

4.4.2.15 Counter value

Explanation: The submenu METER READINGS is used to set the initial values of the energy meters of a channel. At the same time the channel is activated. Activated channels are marked with a "#".

Key:	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Switch between total and tariff
	Cursor-Down	↓	Switch between total and tariff
	Cursor-Right	→	Page between tariff rates (1 - 4)
	Cursor-Left	←	Page between tariff rates (1 - 4)
	Digits (0-9)		Enter the value (00000000 - 99999999)
	Enter	ENTER	If you confirm with the ENTER key, the energy meter is assigned the value entered and summation is restarted. At the same time the marking "#" appears
	Exit	EXIT	Return to the higher-level menu

Submenus: COUNTER VALUE TOTAL, COUNTER VALUE ENERGY TARIFF 1 – 4

The TOTAL meter corresponds to the sum of TARIFF meters (if n = 4). It is permissible to enter 00000000 as a register status.

! Activated channels are marked with a "#". Only activated channels (#) count pulses!

4.4.2.16 Summation registers

Explanation: The submenu SUMS REGISTERS is used to select and set the initial values of the summation registers. The submenu SUMS REGISTERS branches into further submenus: SUM1 - SUM8

Key:	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling (SUM1 – SUM8)
	Cursor-Down	↓	Scrolling (SUM1 – SUM8)
	Enter	ENTER	Call up the submenu (SUM nn)
	Cursor-Up	↑	Scrolling (INP. QUANTIZATION - COUNTER VALUE)
	Cursor-Down	↓	Scrolling (INP. QUANTIZATION - COUNTER VALUE)
	Exit	EXIT	Return to the higher-level menu

The following settings are defined for each summation register (SUM1 - SUM8):

- INP. QUANTIZATION: in the submenu you can set the numerator and the denominator values for the energy and demand meters. The metering pulses of all inputs are weighted and summated into 8 summation registers. Weighting can be selected in a range of -99999999 to 99999999. Negative weighting is only meaningful for summation balance calculation. For simple summation, negative results are not entered in the result register. After summation, the intermediate results are divided by a parameterizable common denominator and entered in the energy or demand registers of the sums. The energy sums can also be weighted with a separate denominator and routed to pulse outputs. On units with sum balance calculation (hysteresis), the CURSOR LEFT and CURSOR RIGHT keys are active under menu items MD-COUNTER and ENERGY COUNTER. With these keys it is possible to change the sign.

  Submenus:
  – MD-COUNTER: numerator and denominator value
  – ENERGY COUNTER: numerator and denominator value
  – Σ-BUFFER: hysteresis
  – PULSE OUTPUT: PULS RATIO 1/nnnnnnnn

Enter	ENTER	Call up the submenu
Cursor-Up	↑	Scrolling
Cursor-Down	↓	Scrolling
Digits (0-9)		Enter the value (00000000+/- to 99999999+/-)
Cursor-Right	→	After the last figure: Change sign to minus (MD-COUNTER and ENERGY COUNTER)
Cursor-Left	←	After the last figure: Change sign to plus (MD-COUNTER and ENERGY COUNTER)
Exit	EXIT	Return to the higher-level menu

- COUNTER VALUE: the submenu is used to set the initial values of the energy meters (total and tariff 1 to 4).

  Submenus:
  – INPUT SUMn TOTAL
  – INPUT SUMn TARIFF (ET1 – ET4)

Enter	ENTER	Call up the submenu
Cursor-Up	↑	Switch between Total and Tariff rate
Cursor-Down	↓	Switch between Total and Tariff rate
Digits (0-9)		Enter the value (00000000 to 99999999)
Cursor-Right	→	Switch between the tariff rates (ET1 – ET4)
Cursor-Left	←	Switch between the tariff rates (ET1 – ET4)
Exit	EXIT	Return to the higher-level menu

4.4.2.17 Maximum resets

Explanation: the maximum reset number is setting with this function. The current reset is assigned a number between 1 and 12 that is automatically incremented on each reset in automatic mode until it reaches 12. Counting then begins at 1 again. In this way, for example with a monthly reset, the current reset number corresponds to the month and can be easily checked. The resets are triggered via the external control input RSTX, the keypad or automatically, depending on the options.

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0-9)		Enter the reset number (1 - 12)
	Exit	EXIT	Return to the higher-level menu

4.4.2.18 Periodic buffers for inputs

Explanation: the submenu PER. BUF. INP is used to configure the cyclic buffers and is not active during measurement, i.e. entries can only be made before the set starting time for measurement. After configuration all cyclic buffers are reset. In the cyclic buffers, all demand values relevant to accounting are stored and can be scanned via the modem interface (slot-in modem or modem interface board MODA02). Up to 16 entries for the meter inputs and/or summation registers can be stored in each buffer. The assignment is defined by assigning the value 1 (store: YES) or the value 0 (do not store: NO) to each input. If the total number of inputs assigned to a buffer exceeds 16 the error message "<!x!>" is shown on the display.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Digits (0 or 1)		1: YES or 2: NO
	Exit	EXIT	Return to the higher-level menu

Submenus: PB-01 and PB-02 for periodic buffer 1 and 2

! If, after parameterization of the cyclic buffers, the number of channels or sums is reduced or summation balance is activated or deactivated, the cyclic buffers are reset and must be configured again!

4.4.2.19 Periodic buffers for summation register

Explanation: the submenu PER. BUF. SUM: see "Periodic buffers for inputs"

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Digits (0 or 1)		1: YES or 2: NO
	Exit	EXIT	Return to the higher-level menu

Submenus: PB-01 and PB-02 for periodic buffer 1 and 2

4.4.2.20 Integration period Tm

Explanation: With the menu item INT. PERIOD Tm, the measuring period duration is defined. The length of the measuring period is the time over which energy and maximum demand values are acquired and accumulated. At the end of each measuring period, these values are transferred to the RAM and possibly to the external data medium or output on the PC or printer. The following time intervals in minutes can be selected as the measuring period length: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Left	←	Select the time period
	Cursor-Right	→	Select the time period
	Exit	EXIT	Return to the higher-level menu

! While measurement is in progress the measuring period duration cannot be changed!

4.4.2.21 Starting time

Explanation: The starting time is the time at which the first measurement starts and can only be entered before measurement begins. If the time entered is before the current time the starting time will only apply to the next day. The format of the starting time is hh-mm (hours - minutes). The minutes can only be selected in predefined time basis. A special character ⧗ (in the standard display) indicates that a starting time has been set. In the standard display, display of the starting time and the system time then alternate. The format of the system time is hh:mm (hours:minutes). The green M-LED for the operating display blinks until the starting time is reached.

Key:			
	Enter	ENTER	Call up the submenu hours (SET HOUR 0..23)
	Digits (0 - 9)		Enter hours
	Enter	ENTER	Call up the submenu minutes (MIN.PLAN Tm← →)
	Cursor-Left	←	Page in minute time base
	Cursor-Right	→	Page in minute time base
	Exit	EXIT	Return to the higher-level menu

4.4.3 Recording break

Explanation: The menu item RECORD. BREAK (recording interruption) is called up from the main menu. (Press the CURSOR DOWN key repeatedly until the menu item is displayed.) It is password-protected and can only be activated while measurement is in progress (green LED lit). The function is called up if it is necessary to manipulate the DataFW4 with operations that require a defined end or start identifier or that cannot be performed while measurement is in progress. At the beginning of a recording interruption, the data of the last complete measuring period are stored. The recording interruption must not exceed the duration of one measuring period because no data are stored for the duration of the recording interruption and the metered value and sum registers are overwritten at the beginning of a new measuring period.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Digits (0 - 9)		Input of the password (up to 8 digits)
	Enter	ENTER	Confirm password
	Exit	EXIT	Return to the higher-level menu

Submenus:

- STORAGE MEDIA: Data medium replacement:
  - disk replacement
  - printer paper replacement
- END OF PROGRAM:
  - end of measurement
  - parameter change (Reassignment of the buffers)
- MAX. RESET

Storage media (data medium replacement)

Explanation: This function (STORAGE MEDIA) triggers a defined recording interruption of approx. 200 ms (the green LED of the CPU begins to flash). An end identifier is sent to the storage and communication unit or to the printer and all measured values of the last measuring period to have been completed are stored or printed out. All incoming pulses are counted, processed and buffered until the end of the current measuring period. At the end of the current measuring period these buffers are read out and cleared or reset to "0", i.e. up to this time recording must have been activated again. For this reason the function recording interruption is disabled if the measuring period only has one minute to go or the last interruption occurred no longer than one minute ago. In both cases this is shown in the display

Key:	Enter	ENTER	Call up the submenu
	Digits (0 - 9)		Input of the password for "media change" (up to 8 digits)
	Enter	ENTER	Confirm password: - possible (green LED blinking): "time for medium replacement" is displayed → perform data medium replacement – disabled: "currently impossible" or "Media password incorrect" is displayed

TIME FOR STARAGE MEDIA

Enter	ENTER	The recording interruption is terminated immediately. All measured values not yet stored are transferred to the RAM and communication unit with the start identifier or output on the printer (green LED lit permanently).
Exit	EXIT	Return to the higher-level menu

If a power failure occurs during the recording interruption, the display returns to the initial display after power recovery and indicates power failure ("!") and the green LED blinks. Call up the menu item STORAGE MEDIA again. The display now shows the message "Continue recording". Terminate the recording interruption as described above by pressing the ENTER key. The green LED is now permanently lit.

End of program

Explanation: This menu item terminates measured value recording. An end identifier is sent to the RAM and communication unit or output on the printer and all inputs are deactivated. The message "End of recording" is shown on the display briefly. The green LED goes out.

Key:	Enter	ENTER	Call up the submenu
	Digits (0 - 9)		Input of the password for "parametrization" (up to 8 digits)
	Enter	ENTER	Confirm password
	Exit	EXIT	Return to the higher-level menu

Before restarting the program all inputs must be activated again (set "#" character).

Maximum resetting

Explanation: The MAX. RESET function can be performed manually outside the normal schedule in addition to the parameterized reset function if this has been enabled during parameterization.

Key:	Enter	ENTER	Call up the submenu
	Digits (0 - 9)		Input of the password for "MD reset" (up to 8 digits)
	Enter	ENTER	Confirm password
	Exit	EXIT	Return to the higher-level menu

The reset frequency can also be set by parameterizing the reset disable. I.e. the reset can be disabled temporarily.

4.4.4 Maintenance

Explanation: The submenu MAINTENANCE does not refer to general maintenance work on the DATA FW but contains the option of formatting Memory Cards in the DATA FW (password-protected) and display test. The memory card must not be write-protected.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Digits (0 - 9)		Input of the password for "media change" (up to 8 digits) by "Format MemoryCard" only
	Enter	ENTER	Confirm password
	Exit	EXIT	Return to the higher-level menu

Submenu: "Format MemoryCard" and "Display Test"

4.4.5 Printing

Explanation: The submenu MAINTENANCE does not refer to general maintenance work on the DATA FW but contains the option of formatting Memory Cards in the DATA FW (password-protected) and display test. The memory card must not be write-protected.

Key:			
	Enter	ENTER	Call up the submenu
	Cursor-Up	↑	Scrolling
	Cursor-Down	↓	Scrolling
	Digits (0 - 9)		Input of the password for "media change" (up to 8 digits) by "Format MemoryCard" only
	Enter	ENTER	Confirm password
	Exit	EXIT	Return to the higher-level menu

Submenu: "Format MemoryCard" and "Display Test"

4.4.6 Delete errors

Explanation: The menu item DELETE ERRORS (clearing alarms) resets the fault status to "0" and clears all alarms, if all faults have been remedied. If the system interrogation is not confirmed, only those alarms are reset which refer to faults which have been remedied (e.g. flashing LEDs after power failure). The fault status is retained for faults that have not been remedied

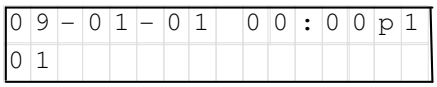
Key:			
	Enter	ENTER	Call up the menu reset faults: "Are all errors removed?"
	Enter	ENTER	All faults have been remedied. The alarm is cleared and the alarm relay is reset (fault status "0")
	Exit	EXIT	Return to the higher-level menu

If not all faults have been remedied: the alarms of the remedied faults are cleared, the alarm relay is not reset (fault status "1")

4.4.7 Periodic buffer shows

Explanation: In menu PER. BUFFER you can call up the measured value results (load profile) with the device status in the measuring period block (see Appendix A: SCTM protocol).

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0 - 9)		Input: YY for year
	Enter	ENTER	Confirm
	Digits (0 - 9)		Input: MM for month
	Enter	ENTER	Confirm
	Digits (0 - 9)		Input: DD for day
	Enter	ENTER	Confirm
	Digits (0 - 9)		Input: HH for hours
	Enter	ENTER	Confirm
	Digits (0 - 9)		Input: MM for minutes
	Enter	ENTER	Confirm
	Digits (1 - 2)		Input: 1 or 2 for periodic buffer 01 or 02
	Enter	ENTER	Confirm
	Digits (0 - 9)		Input: NN for entries in periodic buffer (01 - 16)
	Enter	ENTER	Confirm
	Exit	EXIT	Return to the higher-level menu



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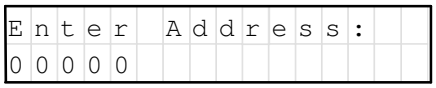
4.4.8 Register address shows

Explanation: In menu REGISTER ADDR you can call up the register addresses (see Appendix B)

Key:			
	Enter	ENTER	Call up the submenu
	Digits (0 - 9)		Enter XXXXX for address
	Enter	ENTER	Confirm
	Enter	ENTER	Next address
	Exit	EXIT	Return to the higher-level menu



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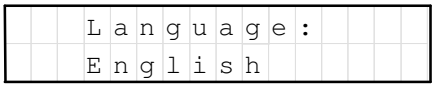
4.5 Language selection

Explanation: The DATA FW system display can be set to various languages. It is possible to switch at any time. The default setting is English.

Key:			
	Cursor-Right	→	Call up the menu item "language selection" (from the standard display)
	Cursor-Up	↑	Scroll through the language selection menu
	Cursor-Down	↓	Scroll through the language selection menu
	Enter	ENTER	Confirm: select the language
	Exit	EXIT	Return to the higher-level menu

Possible languages:

- English
- German
- French
- Dutch/Flemish
- Polish



5 Setting the pulse ratios

To calculate the energy and demand of various input signals with different scaling it is necessary to normalize the incoming pulses to a standard unit. For this purpose the appropriate pulse ratio is set for each input during parameterization with the parameterization software DMFPARA or on the keypad (menu item PARAMETER → PULSE INPUT/OUTPUT → QUANTIZATION). The pulse ratios are determined by integral (whole-numbered) values for the numerator and denominator with up to 8 digits.

Using the methods described in the following sections the average demand is established with respect to the entire integration period.

5.1 Pulse ratios of the metered value inputs

Before beginning measuring, the pulse ratios of all inputs can be set (via the keyboard in the menu item SET PARAMETER → INP. QUANTIZATION or via software DMFPARA). How to proceed is explained using examples.

! The pulse ratios are determined by integral (whole-numbered) values for the numerator and denominator with up to 8 digits!

5.1.1 Digital inputs (pulses)

Numerator / Denominator ratio:

$$\text{Demand (MD)}: \frac{Xp}{Yp} = \frac{W \times 60}{R \times Kp \times Tm} \qquad \text{Energy}: \frac{Xw}{Yw} = \frac{W}{R \times Kw}$$

X, Y : Numerator and denominator, integer, 8 digits

R : Meter constant (e.g. pulses/kWh)

p, w : power (demand), work (energy)

Tm : Measuring period duration in minutes

K : Read constant

W : Transformer constant (U_{prim}/U_{sek} x I_{prim}/I_{sek})

Because the demand values are displayed and stored with 4 digits, it is necessary to define a suitable read constant K_p. It is determined by the following table:

Maximum demand (kW)		Read constant (K)
1	to 10	0,001 (=1/1000)
10	to 100	0,01 (=1/100)
100	to 1000	0,1 (=1/10)
1000	to 10000	1
10000	to 100000	10
100000	to 1000000	100

After multiplication of the displayed and stored demand value by the read constant, you obtain the actual demand. The read constant for the energy values K_w must be preferably set to K_p. However user-specific values are also permitted.

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Example 1:

exist: Displayed value = 1503, Read constant Kp = 10

follow: → Demand (MD) = $1503 \times 10 = 15030$ (kW)

Example 2:

exist: Measuring period duration Tm = 15 min,

Maximum demand P_{max} = 750 kW → read constant Kp = 1/10 (Kw = 1/10)

Meter constant R = 5 pulses/kWh

Transformer constant W = 1

follow:

Demand (MD): $\frac{Xp}{Yp} = \frac{1 \times 60}{5 \times 1/10 \times 15} = \frac{8}{1}$

Numerator (Xp) → 000008

Denominator (Yp) → 000001

Energy: $\frac{Xw}{Yw} = \frac{1}{5 \times 1/10} = \frac{2}{1}$

Numerator (Xw) → 000002

Denominator (Yw) → 000001

After this the meter readings are set using the parameterization software DMFPARA or on the keypad (menu item SET PARAMETERS → COUNTER VALUE) and the pulse inputs are activated! So that you can check activation, the character "#" appears in the INFO display.

! The maximum demand or energy value shown in the display (menu item Info) is to be multiplied by the reading constant (see Example 1).

5.1.2 Signal current inputs

A continuous signal current flow is applied to the signal current inputs (e.g. 0 .. 20 mA, 4 .. 20 mA or 0 .. 50 mA). This current is proportional to the actual demand. By integration of the current over time (i.e. the measuring period) it is possible to calculate the energy consumed, from which the average demand is then calculated.

The analogue values are converted to pulses with f_{max} = 5 Hz inside the unit.

Numerator / Denominator ratio:

$$\text{Demand (MD)}: \frac{Xp}{Yp} = \frac{DIFF}{Tm \times 60 \times 5 \times Kp} \qquad \text{Energy}: \frac{Xw}{Yw} = \frac{DIFF}{3600 \times 5 \times Kw}$$

X, Y : Numerator and denominator, integer, 8 digits

DIFF : Transducer range (max. $value_{encoder}$ - min. $value_{encoder}$) := 5 Hz.

Tm : Measuring period duration in minutes

K : Read constant

The read constant is determined in an analogous way to the digital inputs.

Example 3:

exist: 4mA corresponds to 100 kW (:= min. value)
20mA corresponds to 750 kW (:= max. value)
→ DIFF = 750 kW - 100 kW = 650 kW
Measuring period duration Tm = 15 min
max. demand P_{max} (DIFF) = 650 kW → read constant Kp = 1/10 (Kw = 1/10)

follow:

$$\text{Demand (MD)}: \frac{Xp}{Yp} = \frac{650}{15 \times 60 \times 5 \times 1/10} = \frac{13}{9}$$

Numerator (Xp) → 000013
Denominator (Yp) → 000009

$$\text{Energy}: \frac{Xw}{Yw} = \frac{650}{3600 \times 5 \times 1/10} = \frac{13}{36}$$

Numerator (Xw)→ 000013
Denominator (Yw)→ 000036

After this the meter readings are set using the parameterization software DMFPARA or on the keypad (menu item SET PARAMETERS → COUNTER VALUE) and the pulse inputs are activated! So that you can check activation, the character "#" appears in the INFO display.

A correction value must be added to the average demand value shown on the display. The correction value is calculated as follows:

Correction value = P_{min} = 100 kW

Example 4:

exist: Displayed value = 0123, read constant Kp = 1/10

follow: → Demand (after correction) = (123 × 1/10) +100 = 112,3 (kW)

5.1.3 Customer-specific inputs (if heat meter)

The values of the customer-specific inputs (numerical inputs, e.g. heat calculator) are read in directly from the serial interface. Conversion to demand and energy is performed automatically. To improve the resolution you can correct the read constant.

Demand (MD): $\frac{Xp}{Yp} = \frac{1}{Kp}$ Energy: $\frac{Xw}{Yw} = \frac{1}{Kw}$

X, Y: Numerator and denominator, integer, 8 digits

K: Read constant

Numerator and denominator, integer, 8 digits.

Example 5:

exist: Max. demand: 55 kW → read constant Kp = 1/100 (Kw = 1/100)

follow:

Demand (MD): $\frac{Xp}{Yp} = \frac{1}{1/100} = \frac{100}{1}$

Numerator (Xp) → 000100
Denominator (Yp) → 000001

Energy: $\frac{Xw}{Yw} = \frac{1}{1/100} = \frac{100}{1}$

Numerator (Xw)→ 000100
Denominator (Yw)→ 000001

After this the meter readings are set using the parameterization software DMFPARA or on the keypad (menu item SET PARAMETERS → COUNTER VALUE) and the pulse inputs are activated! So that you can check activation, the character "#" appears in the INFO display.

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5.2 Pulse ratios of the summation registers

All inputs going into a sum must first be reduced to a common denominator

! The pulse ratios are determined by integral (whole-numbered) values for the numerator and denominator with up to 8 digits!

5.2.1 Digital inputs (pulses)

Numerator / Denominator ratio:

Demand (sums): $\frac{X_n ps}{Yps} = \frac{W_n \times 60}{R_n \times Kps \times Tm}$ Energy (sums): $\frac{X_n ws}{Yws} = \frac{W_n}{R_n \times Kws}$

$X_n$ps, $X_n$ws (sum. reg. **s)**	:	Numerator (demand, energy), input number **n** - integer, 8 digits
Yps, Yws (sum. reg. **s)**	:	Common denominator of the pulse inputs used in summation, integer, 8 digits
W_n	:	Transformer constant (for input number **n)**
R_n	:	Meter constant (e.g. pulses/kWh)
Tm	:	Measuring period duration in minutes
K	:	Read constant
p, w	:	power (demand), work (energy)
s	:	Summation register
n	:	Input number

If a pulse input is not to be included in a sum the associated numerator "X_n" must be set to "0".
The common denominator Y is the smallest common multiple of all denominators Y_n!

Example 6:

exist:	Channel 1:	X_1/Y_1 = 3/2	Numerator for channel 1:	Y_1 = 2
	Channel 2:	X_2/Y_2 = 1/3	Numerator for channel 2:	Y_2 = 3
	Channel 3:	X_3/Y_3 = 2/5	Numerator for channel 3:	Y_3 = 5
follow:	→ common denominator: $Y = Y_1 \times Y_2 \times Y_3 = 30$			
	Channel 1:	X_1/Y_1 = 45/30		
	Channel 2:	X_2/Y_2 = 10/30		
	Channel 3:	X_3/Y_3 = 12/30		

The read constant Ks is formed from P_{max}.
P_{max} is the sum of the demands P_N of the "n" pulse inputs used for summation:

$$P_{max} = \sum_{N=1}^{n} P_N \Rightarrow K_S$$

5.2.2 Digital outputs (pulses)

The pulse output rate must not exceed the parameterized maximum pulse frequency f_{max}. For the pulse ratio of the pulse output of a summation register the following applies:

$$Xa = \frac{Yws}{Rs \times Kws}$$

Xa : Pulse output, integer (change Y_{WS} if necessary), 8 digits

Yws : Common denominator of the pulse inputs used in summation (energy), integer, 8 digits

Rs : Meter constant of the summation register (must be specified, e.g. pulses/kWh)

Kws : Read constant

Example 7:

exist:	Common denominator	Yws = 250
	Read constant	Kws = 10
	Required meter constant for pulse output	Rs = 0,1 pulses/kWh

follow pulse output: $Xa = \frac{250}{1/10 \times 10}$ Xa = 250

The pulse lengths and intervals can be changed using the parameterization program DMFPARA (default 90/110 ms → t=200ms). For checking purposes it is advisable to calculate the maximum pulse frequency at the output:

Maximum frequency at the output : $f_{max} = P_{max} \times Rs \times \frac{1}{3600}$ [Hz]

f_{max} : Maximum frequency at the output [Hz]

P_{max} : Maximum demand of the summation registers [kW]

R_s : Meter constant of the summation register [pulses/kWh]

Example 8:

exist:	Maximum demand	P_{max} = 150000 kW
	Meter constant	Rs = 0,1 pulses/kWh

follow: Maximum frequency : $f_{max} = 150000 \times 0.1 \times \frac{1}{3600}$ f_{max} = 4,1667 Hz

5.2.3 Hysteresis

For sum difference calculation, the hysteresis (free-wheeling Lws) prevents rapid output of positive and negative signals onto one pulse output. The sum of the numerators (energy) of all channels used in the summation register multiplied by 2 is the recommended value for the hysteresis:

Hysteresis : $Lws = 2 \times \Sigma |X_n ws|$

Lws : Hysteresis for the summation register

$X_n$ws : Summation register **s**: numerator (energy) for input **n** (see section 5.2 Pulse ratios of the summation registers)

If all summation registers are positive, hysteresis equals zero!

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6 Technical Data

6.1 Housing dimensions

19" rack-mounted unit with 3 height units (3HE):

Width: 482.6 mm (84TE)

Height: 132.5 mm (3HE)

Depth: 270 mm
with 39-way edge connector: min. 330mm

Degree of protection: IP 20 (IEC), IP 50 (with cover)

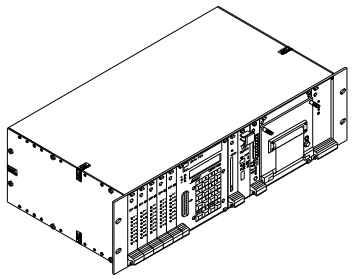

Figure 25, DataFW4 19" rack-mounted unit

Panel mounted, large:

Width: ca. 377 mm (63TE)

Height: ca. 254 mm

Depth: ca. 253 mm

Degree of protection: IP 53 (IEC)

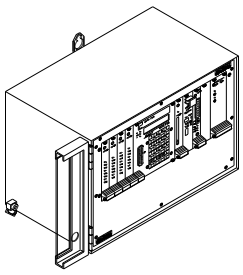

Figure 26, DataFW4 panel mounted, large

Panel mounted, small:

Width: ca. 250 mm (42TE)

Height: ca. 254 mm

Depth: ca. 253 mm

Degree of protection: IP 53 (IEC)

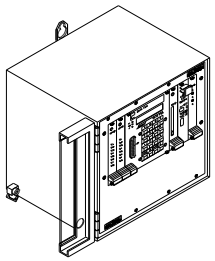

Figure 27, DataFW4 panel mounted, small

Limiting value according to VDE 0701:

Common ground:	≤ 300 mΩ
Insulation test:	Safety class II, ≥ 2 MΩ
Leakage current test:	with interference suppression capacitor ≤ 7 mA

Climatic stress (application class to DIN 40040):

Permissible ambient temperature:	0 to +40 °C (during operation) -10 to +50 °C (during storage and transport)
Humidity stress:	max. 95 % relative humidity (during operation, storage and transport)
Condensation:	not permissible

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6.2 Nominal voltage

Power supply:

For further information see the data sheet of the power supply unit!

Standard power supply unit:	HALTEC DSR 725S-5/15 A
Input voltage (230 VAC):	195-264 VAC
Input voltage (110 VAC):	95-132 VAC
Nominal frequency (50 Hz):	47-63 Hz
Power consumption (Voltage circuit):	< 70 Watt

Changing the auxiliary voltage (HALTEC DSR 725S-5/15 A) 230 VAC ↔ 110 VAC:

The unit can be set for operation with 110 VAC or 230 VAC by repositioning the line fuse. Switching the auxiliary voltage in the DataFW4 is carried out by repositioning the fuse in the power supply unit. All changes should be made whilst the equipment is disconnected from the mains supply! To do this, DataFW4 power supply unit must be unscrewed (by loosening the two screws on the front panel). The fuses are located on the bottom side of the power supply unit.

! When changing the auxiliary voltage, make sure that the proper fuse value (according to sticker on power supply unit) is set!

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6.3 Inputs

S0 pulse (IES) for inputs and control signals:

! Connect only passive switching generators because the IES module supplies a constant current.

Contact resistance: $R_K \leq 800\Omega$

Cable length: ≤ 10m

f_{max}: 5 Hz

Pulse generator supply: 10 mA at 800 Ω, V ≤ 27 V DC

Switching current: I = 2.2 mA still "off"

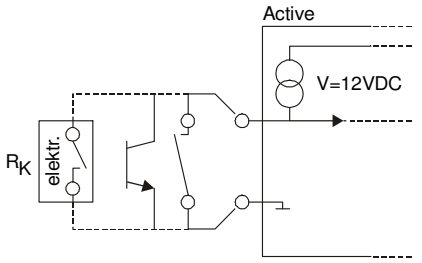

Figure 28, IES-Module

Momentary pulse (IEW):

Vmin: 24 VAC/DC (external)

Vmax: 265 VAC/DC (external)

Imax: 10 mA

fmax: 10 Hz

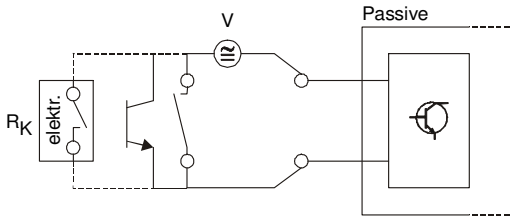

Figure 29, IEW-Module

Bipolar current pulse (IED):

Vmin: 18 VDC

Vmax: 60 VDC

Imax: 5 mA

fmax: 20 Hz

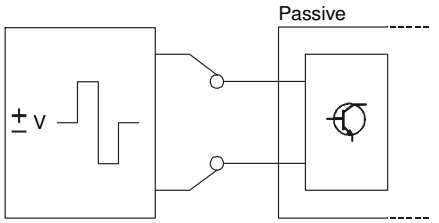

Figure 30, IED-Module

Signal current input board IEAnalog:

A/D-Converter: 12 bit, not potentially isolated

Current: 0 to 20 mA, 4 to 20 mA, 0 to 50 mA

6.4 Pulse / Signal outputs

Momentary output (IAW) "solid state – electronic switch" (general) e.g. summation registers, control outputs:

Vmax: 265 VAC/DC

Imax: 100 mA

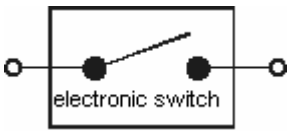

Figure 31, IAW-Output

! The IAW output is an electronic normally open contact (possible for IES).

Relay output "mechanical switch" (error relay, alarm):

Vmax: 250 VAC/DC

Imax: 2 A

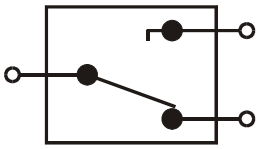

Figure 32, Error relay

Radio clock relay output (MPA, Tariff; option):

Vmax: 220 VAC/DC

Imax: 2 A

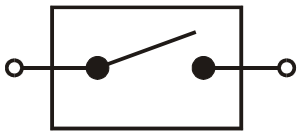

Figure 33, Radio clock relay

Radio clock optocoupler output (option):

Vmax: 70 VAC/DC

Imax: 20 mA

! Polarity important!

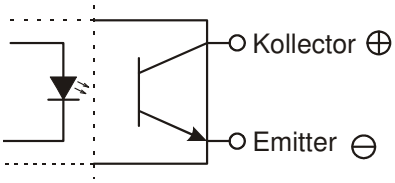

Figure 34, Optocoupler

6.5 Accessories

Lithium battery:

Type:	2450 (e.g. LM2450, CR2450, CR2450N), plus pole outside
Permissible ambient temperature:	-20 to +60° C (during operation) -40 to +60° C (during storage and transport)
Capacity:	500 mAh
Voltage:	3 V
Min. voltage:	2,5 V
Life of the battery:	min. 10 years at 25° C
Self-discharge:	less then 1% in one year (25° C)
Max. current:	less then 5 µA (Typ. 1,5 µA, 25° C)

Order designations:

Unit	**Order no.**	Order designation
Main unit CPU1, VU26 unit	**#5356 (Baer-Type 2450)**	Lithium battery LM2450 (plus pole outside) Alternative: CR2450, CR2450N
MemoryCard	**see MemoryCard**	Lithium battery for MemoryCard

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Appendix A

Communication Protocols

The data stored in the equipment (device parameters, meter values, events such as power failure, parameter changes, etc.) can be interrogated using the **SCTM protocol**, **LSV1 procedure** or **IEC60870-102-5** protocol. The interrogation is serial (7E1 or 8E1) with a settable baud rate (300, 600, 1200, 2400, 4800 or 9600 baud). The data format of the interrogation protocol is defined during parameterization:

- 7E1: SCTM protocol or LSV1 procedure
- 8E1: IEC60870-5-102 protocol

After the RESTART, the unit is set to the SCTM protocol. You must select the required protocol before starting measurement. However, it is still possible to switch between two protocols after the start of measurement.

SCTM protocol

The following sections describe the data format of the telegrams for communication with the SCTM protocol (Serial Code TeleMetering).

Restrictions:

- The first 5 digits of the unit ID are for the station number in the SCTM protocol (US number)
- Point to point with 5 digits US number
- Header length is 14 bytes (fix)
- No command "To all"
- Only one integration period (Tm1)

Following inquiry are possible:

- Cyclic buffer 1 and 2 (PP01 and PP02)
- Spontaneous buffer S51
- Addresses 000-00 ... 999.99

Device status in the measuring period block

The device status refers to the measuring period concerned and its data. It consists of 4 characters in ASCII character format. To improve readability the assignment of the ASCII character to the bit combinations is the same as for hexadecimal representation.
Hexadecimal → binary:

Hex	Binary	Hex	Binary	Hex	Binary	Hex	Binary
0	0000	4	0100	8	1000	C	1100
1	0001	5	0101	9	1001	D	1101
2	0010	6	0110	A	1010	E	1110
3	0011	7	0111	B	1011	F	1111

The device status of the measuring periods of the DataFW4 units is grouped together in 2 bytes of 2 ASCII characters each:

1st byte								2nd byte							
1st ASCII character				2nd ASCII character				3rd ASCII character				4th ASCII character			
T-bit	U-bit	M-bit	A-bit	S-bit	0	NP-bit	0	0	1	0	0	0	0	0	0

Meaning of the bits:

Byte pos. number	Bit position number	Content	Explanation
Byte 1	Bit 7	T-bit	Time setting, summer time switch over
	Bit 6	U-bit	Shortened measuring period because of time reset or power failure
	Bit 5	M-bit	Parameters changed
	Bit 4	A-bit	Alarms
	Bit 3	S-bit	Sent during summer time
	Bit 2	0	Not used
	Bit 1	NP-bit	Entire measuring period without voltage
	Bit 0	0	Not used
Byte 2	0100 0000		Number 40 in the binary system (hexadecimal representation)

Note: S-bit := 0 → Winter time (:= MEZ)

Example for device status in the measuring period block (byte 2 := 40 or 0100 0000):

Device status	→ Bits	Explanation
00 40	0000 0000 0100 0000	No fault, winter time
02 40	0000 0010 0100 0000	Entire measuring period without voltage (NP-bit=1), winter time
08 40	0000 1000 0100 0000	No fault, summer time (S-bit=1)
0A 40	0000 1010 0100 0000	Summer time (S-bit=1), entire measuring period without voltage (NP-bit=1)
10 40	0001 0000 0100 0000	Alarm (A-bit=1), winter time
20 40	0010 0000 0100 0000	Parameters changed (M-bit=1), winter time
50 40	0101 0000 0100 0000	Shortened measuring period (U-bit=1), alarm (A-bit=1), winter time

Equipment status in the spontaneous buffer

The equipment status that is recorded in the spontaneous buffer represents the internal DataFW4 status. It consists of 8 characters in ASCII character format and is stored in 4 equipment status bytes in the sequence 1, 2, 3, 4. The bit combinations also correspond to hexadecimal representation.:

1st byte								2nd byte								3rd byte								4th byte				
1st char.				2nd char.				3rd char.				4th char.				5th char.				6th char.				7th char.				8th char.
0	0	0	B4	B3	B2	B1	B0	B7	B6	B5	B4	B3	B2	B1	B0	B7	B6	B5	0	0	B2	B1	B0	B7	B6	B4	B3	group information

Meaning:

1st byte	Bit 7	-	Not used
	Bit 6	-	Not used
	Bit 5	-	Not used
	Bit 4	General status message	Radio clock (GPS) activated (0 = no/1 = yes)
	Bit 3	General status message	Logical output 4 activated
	Bit 2	General status message	Logical output 3 activated
	Bit 1	General status message	Logical output 2 activated
	Bit 0	General status message	Logical output 1 activated

2nd byte	Bit 7	MemCard: RAM/TIMER	MSC01 RAM or TIMER defective
	Bit 6	Radio clock received no data	No radio clock reception in the last 24 hours
	Bit 5	Pulse output 4 overflow	Pulse output – SUM4 - overflow
	Bit 4	Pulse output 3 overflow	Pulse output – SUM3 - overflow
	Bit 3	Pulse output 2 overflow	Pulse output – SUM2 - overflow
	Bit 2	Pulse output 1 overflow	Pulse output – SUM1- overflow
	Bit 1	Energy input (channel) or sum overflow	Energy register overflow
	Bit 0	Demand input (channel) or sum overflow	Demand register overflow

3rd byte	Bit 7	MSC01: Hardware error	MSC01 EPROM defective or rechargeable battery fault
	Bit 6	CALEC: No data!	Heat meter not supplying data
	Bit 5	SYN not in range	Synchronization outside the permitted time range
	Bit 4	-	Not used
	Bit 3	-	Not used
	Bit 2	Printer buffer overflow	Printer memory overflow
	Bit 1	EPROM checksum incorrect!	CPU EPROM defective
	Bit 0	RAM fault	Fault in the internal CPU memory

4th byte	Bit 7	SYSTEM: Power failure occurred!	Power failure recorded
	Bit 6	MEMORY: Communication	Serial link CPU data memory defective
	Bit 5	PRINTER: Printer has no paper	End of paper reached
	Bit 4	PRINTER: Fault	Parallel interface: printer defective
GROUP INFORMATION	Bit 0..3 (0÷F)	DISK/MEMORY-FAULT	
	0:	No fault	
	1:	Read error	Fault on reading data from external medium
	2:	Write error	Fault on storing data to external medium
	3:	Medium 95 % full	External data medium 95 % full
	4:	Medium full	External data medium 100 % full
	5:	Write-protected	External data medium write-protected
	6:	Wrong format	Surface defect/not formatted
	7:	No data medium	External data medium not inserted
	8:	Buffer overflow	Overflow of the internal memory
	9:	MemCard on stand-by bat.	MemCard supply switched over to stand-by battery
	A:	MemCard battery flat	MemCard battery flat (replace!)
	B:	MemCard not formatted	MemCard not properly inserted or formatted
	C:	Hardware fault	MSC01 EPROM defective or rechargeable battery failure
	D:	RAM/timer fault	MSC01 RAM or TIMER defective
	E:	Hardware fault	Hardware fault in RAM
	F:	General fault	General fault on external data medium

Example (see address 700-11 or spontaneous buffer 051-xx):

Status	Explanation
00 00 00 00	-
10 00 00 00	Radio clock activated
10 00 00 80	Radio clock activated, power failure recorded
00 00 00 07	External data medium not inserted
15 00 00 00	Radio clock activated, Logical outputs 1 and 4 activated
0F 00 00 AB	Logical outputs 1, 2, 3 and 4 activated, power failure recorded, end of paper reached, MemCard not properly inserted or formatted

Metered value status in the measuring period block

A 1-byte long metered value status is generated for each entry in cyclic buffers 1 or 2. Bit 6 is set (:= 1) in the metered value status if a power failure occurs:

Byte 1							
1st character				2nd character			
0	Bit 6	0	0	0	0	0	0

Periodic buffer

Transmission of the meter values in the SCTM protocol. With the SCTM protocol, you can choose between 4 and 6 decades per meter value. This means that if you want to transmit 6 decades two zeros are added to the 4 decades because the demand values are calculated with 4 digits (fix).

The number of decades (4, 6 or 8) and the factor (multiplication by 1 or 100) is setting by DMFPARA.

Example: saved value: 1234 → outputting value (by SCTM standard): 123400 (by faktor = 100)

Values	Number of decades	Outputting values	
		Factor = 1	Factor = 100
1 2 3 4	4	1 2 3 4	3 4 0 0
	6	0 0 1 2 3 4	Default: 1 2 3 4 0 0
	8	0 0 0 0 1 2 3 4	0 0 1 2 3 4 0 0
1 2 3 4 5 6	4	3 4 5 6	5 6 0 0
	6	1 2 3 4 5 6	3 4 5 6 0 0
	8	0 0 1 2 3 4 5 6	1 2 3 4 5 6 0 0
1 2 3 4 5 6. 7 8	4	5 6 7 8	7 8 0 0
	6	3 4 5 6 7 8	5 6 7 8 0 0
	8	1 2 3 4 5 6 7 8	3 4 5 6 7 8 0 0

Default: decades = 1, factor = 100

Note: 6 or 8 digits are only by energy values possible!

Address list for SCTM

In the following table the markings mean:

Mark	Explanation
*	Table addresses can be set by remote parameterization!
✪	The table values have **12** or **16** digits (for all software versions)
without ✪	The table values have **16** digits (not on older software versions)

Simultaneous local and remote parameterization must be avoided!
Simultaneous local parameterization and remote interrogation is allowed as long as the communication parameter such as baud rate, received disable time, send delay time, inactivity time-out and protocol type are **not** changed!

Date and time

✪ 000 -00 **Current date with time**

Table value	Y	Y	M	M	D	D		W	H	H	m	m

Y Y = year, M M = month, D D = day,
W = day of week (1 = Monday, 7 = Sunday),
H H = hour, m m = minute

Example:	9	4	0	1	0	1		6	0	0	0	2

Explanation: Date: 01. January 1994,
Day of week: Saturday,
Time: 00:02

✪ 000 -01 **Winter/summer time switchover**

Table value	Y	Y	M	M	D	D			H	H	m	m

Y Y = year, M M = month, D D = day,
H H = hour, m m = minute

Example:	9	4	0	3	2	7			0	1	5	9

Explanation: Date: 27. March 1994,Time: 01:59. Last time that was received by the CPU marked as winter time

✪ 000 -02 **Summer/winter time switchover**

Table value	Y	Y	M	M	D	D			H	H	m	m

Y Y = year, M M = month, D D = day,
H H = hour, m m = Minute

Example:	9	4	0	9	2	5			0	2	5	9

Explanation: Date: 25. September 1994,Time: 02:59. Last time that was received by the CPU marked as summer time

✪	000	-03	**Winter/summer time flag**
			Table value: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][S] S = winter/summer time flag 0 = currently winter time 1 = currently summer time Example: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][1]
			Explanation: Summer time
✪	010	-00	**Latest measuring period**
			Table value: [Y][Y][M][M][D][D][ ][ ][h][h][m][m] YY = year, MM = month, DD = day, hh = hour, mm = minute Example: [9][4][0][9][2][5][ ][ ][0][2][1][5] Explanation: Date: 25. September 1994,Time: 02:15. Date and time of the latest measuring period to have been completed

Status change			
✪	051	-xx	**xx = Number of the spontaneous buffer entry** (cannot be directly interrogated, only contained in the spontaneous buffer)

Meter readings of the latest measuring period			
✪	100	-xx	**Energy values tariff rate 1**
✪	100	-00	Meter 01
✪		:	Meter xx
✪	100	-31	Meter 32
✪	100	-32	Sum 01
✪		:	Sum xx
✪	100	-39	Sum 08 Table value: [ ][ ][ ][ ][A][A][A][A][A][A][A][A] AAAAAAAA = Meter reading Example: [ ][ ][ ][ ][9][7][5][3][0][8][6][4] Explanation: Meter readings of the latest measuring period of the selected meter and tariff rate
✪	101	-xx	**ditto for tariff 2**
✪	102	-xx	**ditto for tariff 3**
✪	103	-xx	**ditto for tariff 4**

Meter readings of the latest measuring period

✪	104	-xx	**Demand values**
✪	104	-00	Meter 01
✪		:	Meter xx
✪	104	-31	Meter 32
✪	104	-32	Sum 01
✪		:	Sum xx
✪	104	-39	Sum 08

if 6 decades were selected for MSC01 V 3.xx, V 4.xx, V 5.xx and Fc01 V 4.xx

Table value					0	0	L	L	L	L		
LLLLLL = Demand values												
Example:					0	0	9	8	7	6		

if 6 decades were selected and MSC01 V 1.xx and Fc01 V 3.xx

Table value							L	L	L	L	0	0
LLLLLL = Demand values												
Example:							9	8	7	6	0	0

✪	104	-xx	**if 4 decades were selected**

Table value									L	L	L	L
LLLL = Demand values												
Example:									9	8	7	6

Explanation: The demand values always have 4 figures. If you select 6 decades, 2 zeros are added to 4 decades of the demand value (customer-specific).

Data for load checking

✪ 105 -xx

30 s load check data
(optional)

✪ 105 -00

Measuring period identifier 0 to 9999

Table value									k	k	k	k

kkkk = measuring period identifier (x 30 seconds)

Example:									0	0	0	1

Explanation: 1 x 30 seconds have elapsed since the beginning of the measuring period.

✪ 105 -01 Summation register 1

✪ 105 -02 Summation register 2

✪ 105 -03 Summation register 3

✪ 105 -04 Summation register 4

Table value									s	s	s	s

Example:									0	0	2	1

Explanation: 21 pulses for summation register X have been counted since the beginning of the measuring period.

✪ 105 -05

Group value of measuring period identifier SUM1, SUM2, SUM3, SUM4
(20 characters)

Table value	k	k	k	k	S1	S1	S1	S1	S2	S2	S2	S2	S3	S3	S3	S3	S4	S4	S4	S4

k = measuring period identifier,
S1 to S4 = summation register 1 to 4

Example	0	0	0	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0

Explanation: In the first 2 X 30 seconds of the current measuring period 21 pulses were counted for summation register 1.

Data for load checking

105 -06

Group value measuring period identifier, inputs 1 to 32
(132 characters)

Table value

k	k	k	k	Z1	Z1	Z1	Z1	Z2	Z2	Z2	Z2	Z3	Z3	Z3	Z3	Z4	Z4	Z4	Z4

to

Z28	Z28	Z28	Z28	Z29	Z29	Z29	Z29	Z30	Z30	Z30	Z30	Z31	Z31	Z31	Z31	Z32	Z32	Z32	Z32

k = measuring period identifier,
Z1 to Z32 = meters 1 to 32

Example

0	0	0	3	0	0	1	8	0	0	0	0	0	0	0	0	0	0	0	0

to

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Explanation: In the first 3 x 30 seconds of the current measuring period 18 pulses were counted for meter 1.

109 -00

Last maximum reset: date and time

Table value

		n	n		M	M	-	D	D		h	h	:	m	m

nn = reset number
MM = month, DD = day
hh = hour, mm = minute

Example:

		0	1		0	2	-	2	1		1	2	:	5	1

Explanation: The reset "1" was performed on February 21st at 12:51 o'clock..

Sign (assignment of the summation registers)

400 -xx

Input xx + 1

xx = 00 to 31: inputs 1 to 32

Table value

S8D	S7D	S6D	S5D	S4D	S3D	S2D	S1D	S8E	S7E	S6E	S5E	S4E	S3E	S2E	S1E

S8D to S1D: sums 8 to 1 (D = demand),
S8E to S1E: sums 8 to 1 (E = energy),
0 = positive, 1 = negative

Example:

0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1

Explanation: Input xx is added (negative) to
sum 1 (energy), sum 4 (energy),
sum 1 (demand) and sum 4 (demand) with the sign "-"..

Sum balance

401 -00 **Sum balance on / off**

Table value																
																S

S = 0 - sum balance off,
S = 1 - sum balance on,
default = 0

Example:																1

Explanation: Sum balance on

Last maximum reset (value and time)

41y -xx **Maximum of MD values and time (y = 0 to 3)**

y = 0 to 3: maximum demand tariff 1 to 4
xx = 00 to 31: inputs 1 to 32
xx = 64 to 71: sums 1 to 8 positive (e.g. import)
xx = 72 to 79: sums 1 to 8 negative (e.g. export)

Table value	M	M	M	M		M	M	.	D	D		h	h	:	m	m

MMMM = Maximum value and time (month.day hour:min)

Example:	9	8	7	6		0	1	.	0	3		0	8	:	1	5

Explanation: Maximum value: 9876. date: 03. January, time: 08:15

41y -xx **Energy values by last maximum reset (y = 4 to 8)**

y = 4: total energy value
y = 5 to 8: energy tariff 1 to 4
xx = 00 to 31: inputs 1 to 32
xx = 64 to 71: sums 1 to 8 positive (e.g. import)
xx = 72 to 79: sums 1 to 8 negative (e.g. export)

Table value									E	E	E	E	E	E	E	E

EEEEEEEE = Energy value

Example:									1	2	3	4	5	6	7	8

Explanation: Energy value: 12345678, date: see address 109-00

Number of ...

600 -00 **Inputs**

Table value															n	n

nn = number of inputs

Example:															3	2

Explanation: The unit has 32 meter inputs.

600 -01 **Summation registers**

Table value															n	n

nn = number of summation registers

Example:															0	8

Number of ...

Explanation: The unit has 8 summation registers.

600 -02 **Energy tariff rates and maximum demand tariff rates**
(tariff setting)

Table value														ET		DT
Example:														4		4

Explanation: The unit is set for 4 energy tariff rates and 4 maximum demand tariff rates.

Activation states: inputs activated
(Character "#" in the INFO display)

601 -00 **Bit pattern of inputs 01 to 08**

Table value									E1	E2	E3	E4	E5	E6	E7	E8
Example:									1	1	0	0	0	0	0	0

Explanation: Inputs 01 and 02 are active,
inputs 03 to 08 are not active

601 -01 **Bit pattern of inputs 09 to 16**

Table value									E 9	E 10	E 11	E 12	E 13	E 14	E 15	E 16
Example:									0	1	1	0	0	0	0	0

Explanation: Inputs 10 and 11 are active,
inputs 09 and 12 to 16 are not active

601 -02 **Bit pattern of inputs 17 to 24**

Table value									E 17	E 18	E 19	E 20	E 21	E 22	E 23	E 24
Example:									0	0	0	1	0	0	0	0

Explanation: Input 20 is active,
Inputs 17 to 19 and 21 to 24 are not active

601 -03 **Bit pattern of inputs 25 to 32**

Table value									E 25	E 26	E 27	E 28	E 29	E 30	E 31	E 32
Example:									0	0	0	0	0	1	0	0

Explanation: Input 30 is active,
inputs 25 to 29 and 31 and 32 are not active

Pulse matching (scaling)

602 -xx **Energy numerator**

602 -01 Input 01
: Input xx
602 -32 Input 32

Table value									0	0	Z	Z	Z	Z	Z	Z
Example:									0	0	8	9	7	6	4	3

Explanation: Although you can select an 8-figure numerator with the new CPU, only the 6 least significant positions are displayed. The two most significant positions are covered up with "0". However, all calculations are performed with the full 8-figure numerator.

603 -xx **Energy denominator**

603 -01 Input 01
: Input xx
603 -32 Input 32

Table value									0	0	N	N	N	N	N	N
Example:									0	0	9	8	7	6	5	4

Explanation: As for the numerator only the 6 least significant positions of the denominator are displayed although all 8 positions are taken into account (internally).

604 -xx **Demand numerator**

604 -01 Input 01
: Input xx
604 -32 Input 32

Table value									0	0	Z	Z	Z	Z	Z	Z
Example:									0	0	7	8	6	4	3	2

Explanation: As with pulse matching with energy (numerator) only the 6 least significant positions are displayed although (internally) all 8 positions are taken into account.

Pulse matching (scaling)

605	-xx	**Demand denominator**
605	-01	Input 01
	:	Input xx
605	-32	Input 32

Table value

								0	0	N	N	N	N	N	N

Example:

								0	0	7	8	9	1	2	3

Explanation: As with pulse matching for energy (denominator) only the 6 least significant positions are displayed, although (internally) all 8 positions are taken into account.

Pulse output matching (scaling)

607	-xx	**Denominator for summation registers 01 to 08**
607	-01	Summation register 01
	:	Summation register xx
607	-08	Summation register 08

Table value

								n	n	n	n	n	n	n	n

Example:

								9	8	7	6	5	4	3	2

Explanation: If the value is "0", the pulse output is disabled.

Assignment of the summation registers

61y	-xx	**Energy summation registers (y = 1: sum1 to y = 8: sum8)**
61y	-00	Common denominator

Table value

								0	0	N	N	N	N	N	N

Example:

								0	0	2	3	4	9	8	7

Explanation: Only the 6 least significant positions are displayed although (internally) all 8 positions are taken into account.

Assignment of the summation registers

61y -01 Numerator input 01
: Numerator input xx
61y -32 Numerator input 32

Table value									0	0	Z	Z	Z	Z	Z	Z
Example:									0	0	0	0	0	0	0	2

Explanation: Only the 6 least significant positions are displayed although (internally) all 8 positions are taken into account.

62y -xx **Demand summation registers (y = 1: sum1 to y = 8: sum8)**

62y -00 Common denominator

Table value									0	0	N	N	N	N	N	N
Example:									0	0	3	4	5	6	7	8

Explanation: Only the 6 least significant positions are displayed although (internally) all 8 positions are taken into account.

62y -01 Numerator input 01
: Numerator input xx
62y -32 Numerator input 32

Table value									0	0	Z	Z	Z	Z	Z	Z
Example:									0	0	9	9	9	4	5	6

Explanation: Only the 6 least significant positions are displayed although (internally) all 8 positions are taken into account.

Logical inputs

* 660 -00 **Activation state**

Table value																L
Example:																1

0 = inactive
1 = active

Explanation: Logical inputs are active

Version and hardware information

✪ 700 -xx — **Information** (general)

✪ 700 -00 — **Name**

Table value: S C T M - C o n t r o l

✪ 700 -01 — **Version of the main memory**

Table value: V . v . s s

v = version
ss = subversion

Example: V . 6 . 1 9

Explanation: Version 6.11

✪ 700 -02 — **Version date**

Example: 2 5 . 0 6 . 1 9 9 8

Explanation: 25th June 1998

✪ 700 -03 — **Company** (manufacturer)

Table value: B a e r G m b H

✪ 700 -04 — **Transmission format**

Table value: (b b b b , E , 7 , 1)

bbbb = baud rate

Example: (2 4 0 0 , E , 7 , 1)

Explanation: Transmission rate = 2400 Baud
even parity
7 data bits, 1 stop bit

✪ 700 -05 — **CPU** (processor type)

Table value: C P U : t t t t t

Example: C P U : 6 8 3 0 1

Version and hardware information

✪ 700 -06	**Transmission module** Example: 1 `D U A R T : 6 8 6 8 1` Explanation: The external 68681-DUART is used. Example: 2 `D U A R T ( 6 8 3 0 1 )` Explanation: The DUART integrated in the 68301 is used.
✪ 700 -07	**RAM size** Table value `R A M : g g g K` ggg = size Example: 2 `R A M : 2 5 6 K` Explanation: RAM size 256 kb
✪ 700 -08	**ROM size** Table value `R O M : g g g K` ggg = size Example: 2 `R O M : 6 4 K` Explanation: ROM size 64 kb
✪ 700 -09	**Data media used** Example: 1 `D I S K : 7 2 0 K` Explanation: Diskette size 720 kb Example: 2 `D I S K : - - - -` Explanation: No data media Example: 3 `M e m o r y C a r d` Explanation: Data medium is a memory card

Version and hardware information

✪ 700 -10 **Free disk capacity in % or memory card capacity in measuring periods**

Example: 1

D	i	s	k	k	a	p	:		1	8	%

Explanation: 18% free capacity on the diskette.

Example: 3

						1	2	9	2	4	5

Explanation: Alarm: power failure

✪ 700 -11 **Equipment status (byte 4 to byte 1), meaning as for equipment status in the spontaneous buffer**

Table value

				S	S	S	S	S	S	S	S
				1st byte		2nd byte		3rd byte		4th byte	
				Bits 4..7	Bits 0..3	Bits 4..7	Bits 0..3	Bits 4..7	Bits 0..3	Bits 4..7	Bits 0..3

Example:

				1	0	0	0	0	0	8	0

Explanation: Radio clock activated, power failure recorded

700 -12 **DataFW4 -CPU equipment identifier**

Example:

G	e	M	c	M	k	D	U	L							

Explanation: has only internal significance

700 -13 **DataFW4 -CPU version identifier**

Example:

				V	.	2	.	2	1						

Explanation: Version 2.11

Time periods

✪ 701 -01 **Measuring period duration** (in minutes)

Table value

										m	m

mm = minutes

Example:

										0	2

Explanation: Measuring period duration = 2 minutes

Communication

✪	800 -00	**Communication on/off** (always '1') Table value: 1
✪	800 -01	**Protocol** Table value: P Explanation: 0 = SCTM, 1 = LSV1, 2 = IEC60870-5-102
✪	801 -00	**Memory for cyclic buffers** (in bytes) Example: 486000 Explanation: 486 000 bytes are reserved for the cyclic buffer in the RAM
✪	801 -01	**Memory for cyclic buffers** (in measuring periods) Example: 69428 Explanation: 69 428 measuring period entries fit into the cyclic buffer in the RAM.
	802 -01	**SCTM subposition number** Table value: UUUUU UUUUU = subposition number Example: 12345
	802 -08	**SCTM subposition number only for the interrogation of CB-01** Table value: U1U1U1U1U1 Example: 00001 Comment: If the value is "AAAAA" no additional subposition number has been assigned for the interrogation of CB-01.
	802 -09	**SCTM subposition number only for the interrogation of CB-02** Table value: U2U2U2U2U2 Example: 00022 Comment: If the value is "AAAAA". no additional subposition number has been assigned only for the interrogation of CB-02.

Communication

803 -00 **Baud rate SCTM/LSV1/IEC60870-5-102**

Table value													b	b	b	b
bbbb = baud rate																
Example:													2	4	0	0

803 -01 **Baud rate DIN 19244/IEC60870 – 1min (load prognosis / check: CPU1 only)**

Table value													b	b	b	b
bbbb = baud rate																
Example:													2	4	0	0

803 -04 **Baud rate for the 2nd interface from MSC01/DS01**

Table value													b	b	b	b
bbbb = baud rate																
Example:													2	4	0	0

803 -05 **Block number for MSC01/DS01 V.6.00**

Table value															B	B
BB = block number (00= like DataFW4-Standard, 01= like SCTM-Standard)																
Example:															0	0

✪ 804 -00 **Maximum block length** (always '255')
for FC01 up to an including V 3.xx and MSC01 up to including V 2.xx

Table value										2	5	5			
For later versions (actually version)															
Table value													2	5	5

Communication

*	804	-01	**Number of decades 4 or 6** for FC01/VU26 up to an including V 4.xx and MSC01/DS01 up to including V 5.xx

Table value

															d

d = 4 or 6

Explanation: The number of decades for outputting the demand values can be set initially to 4 or 6. Internally the power demand values are only treated as 4-decade numbers.

	810	-00	**Operation** (status)

Table value

											B

0 = measurement stopped
1 = measurement running

Example:

											1

Explanation: Measurement running.

Assignment CB-01 (Cyclic Buffer-01)

✪	821	-00	**Bit pattern input-01 to input-08**

Table value

				p8	p7	p6	p5	p4	p3	p2	p1

Example:

				0	0	0	0	1	1	1	1

Explanation: Pulse inputs 01 to 04 are stored in the cyclic buffer CB-01.

✪	821	-01	**Bit pattern input-09 to input-16**

Table value

				p 16	p 15	p 14	p 13	p 12	p 11	p 10	p 9

Example:

				0	0	0	0	0	0	1	1

Explanation: Pulse inputs 09 and 10 are stored in the cyclic buffer CB-01.

Assignment CB-01 (Cyclic Buffer-01)

✪ 821 -02 **Bit pattern input-17 to input-24**

Table value					p 24	p 23	p 22	p 21	p 20	p 19	p 18	p 17
Example:					0	0	0	0	0	1	0	1

Explanation: Pulse inputs 17 and 19 are stored in the cyclic buffer CB-01.

✪ 821 -03 **Bit pattern input-25 to input-32**

Table value					p 32	p 31	p 30	p 29	p 28	p 27	p 26	p 25
Example:					0	0	0	1	1	0	0	0

Explanation: Pulse inputs 28 and 29 are stored in the cyclic buffer CB-01.

✪ 821 -04 **Bit pattern sum-1 to sum-8**

For summation in one direction of power flow:

Table value					S8	S7	S6	S5	S4	S3	S2	S1

S = summation register

If summation balance calculation is active then:

Table value					S4 -	S4 +	S3 -	S3 +	S2 -	S2 +	S1 -	S1 +
Example:					0	0	0	0	0	0	1	1

Explanation: Summation registers 1 and 2 are stored in cyclic buffer CB-01 if the summation balance calculation is not activated. Otherwise this means that S1+ and S1- are stored in CB-01.

Assignment CB-02 (Cyclic Buffer-02)

✪ 822 -00 **Bit pattern input-01 to input-08**

Table value					p8	p7	p6	p5	p4	p3	p2	p1
Example:					0	0	0	0	0	0	1	1

Explanation: Pulse inputs 01 and 02 are stored in the cyclic buffer CB-02.

✪ 822 -01 **Bit pattern input-09 to input-16**

Table value					p 16	p 15	p 14	p 13	p 12	p 11	p 10	p 9
Example:					0	0	0	0	0	0	1	1

Explanation: Pulse inputs 09 and 10 are stored in the cyclic buffer CB-02.

✪ 822 -02 **Bit pattern input-17 to input-24**

Table value					p 24	p 23	p 22	p 21	p 20	p 19	p 18	p 17
Example:					0	0	0	0	0	0	1	1

Explanation: Pulse inputs 17 and 18 are stored in the cyclic buffer CB-02.

✪ 822 -03 **Bit pattern input-25 to input-32**

Table value					p 32	p 31	p 30	p 29	p 28	p 27	p 26	p 25
Example:					0	0	0	0	0	0	1	1

Explanation: Pulse inputs 25 and 26 are stored in the cyclic buffer CB-02.

Assignment CB-02 (Cyclic Buffer-02)

✪ 822 -04 **Bit pattern sum 1 to sum 8**

For summation in one direction of power flow:

Table value					S8	S7	S6	S5	S4	S3	S2	S1
					S = summation register							

If summation balance calculation is active then:

Table value					S4 -	S4 +	S3 -	S3 +	S2 -	S2 +	S1 -	S1 +
Example:					0	0	0	0	0	0	1	1

Explanation: Summation registers 1 and 2 are stored in cyclic buffer CB-02 if the summation balance calculation is not activated. Otherwise this means that S1+ and S1- are stored in CB-02.

Identifier

832 -00 **DataFW4 equipment identifier**

Table value	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
Example:	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6

Explanation: The first 5 positions of the equipment identifier (12345) represents the SCTM sub position number.

Printer

* 860 -00 **Status / option**

Table value															x	y

y: 0 = printer inactive (follow xy = 00)
1 = print all values (measured values and sums)
2 = print only sums

x: 1 = automatic daily list at the end of the day
2 = automatic monthly list at the end of the month

Example:															1	1

Explanation: All values are printed with automatic daily list.

Password

✪ 900 -00 **Last password entered**

Table value

										p	p

00 = incorrect main password
01 = correct main password

Example:

										0	1

Explanation: The last password entered was correct.

Radio clock (Germany only)

✪* 901 -00 **DCF reception**

Table value

															d

0 = Off
1 = On

Example:

															1

Explanation: Radio clock reception is taken into account.

Free identifier

950 -00 **Interrogation**

Table value

Example:

Explanation: At present only blanks.

Synchronization			
✪*	998	-xx	**Seconds to be set (to ss)**
✪*	998	-00	**SSYN T2 (set seconds)** Table value: s s Example: 0 5 Explanation: With SSYN, the year, month, day, hour, minute, day of week communicated in the command SETTIME and the seconds as indicated here are accepted. However, you should not set the seconds greater than "20".
*	998	-01	**MSYN T3 (minute synchronization)** Table value: s s Explanation: The minutes are set to "0", the seconds to "SS".
*	998	-02	**MSYN T4 (second synchronization)** Table value: s s Explanation: If "0", minute = minute + 1, for second > 29 If "ss" = 00, then the minute is incremented by 1, if the seconds > 29. The seconds are set to "ss".

Test data: the following table addresses are only intended for test purposes:

Test data

900 -01

Up to the first 8 bytes of the last message received by the CPU and acknowledged with NAK (message only).

Example:	0	1	5	F											

Explanation: For the interrogation of the FC01-ID string.
(Expected message in hexadecimal: FF 01 5F <BCC>)

900 -02

Up to the last 8 bytes of the last frame received by the CPU and acknowledged with NAK (message only).

Example:													0	1	5	F

Explanation: For the interrogation of the FC01-ID string.

900 -03

Cause of the acknowledgement with NAK SCTM message format:

Table value																U

U = 1 Incorrect message length or for messages with message such as 1F 1F or 6F 6F, if the first byte is not equal to the second.

U = 2 Incorrect numerator number (not 0 or 1 to 32) or incorrect sum number (not 1 to 8 or for messages with sign not 1 to 16.)

U = 3 Incorrect date or incorrect time.

U = 4 Incorrect parameter value.

U = 5 Incorrect check sum.

U = 6 Incorrect ID byte (or for minute data a byte other than XA or XB).

900 -04

Date and time for the message received by the CPU and acknowledged with NAK.

SCTM message format

Table value	Y	Y	Y	Y	M	M	D	D		W	h	h	m	m		

YYYY = year
MM = month
DD = day
W = day of the week
hh = hour
mm = minute

900 -05

Date and time before 1980 to which a measuring period was assigned but cannot be stored in the cyclic buffer.

SCTM message format

Table value	Y	Y	Y	Y	M	M	D	D	h	h	m	m				

YYYY = year
MM = month
DD = day
W = day of the week
hh = hour
mm = minute

Example:	1	9	7	9	0	1	0	1	0	0	0	0				

Address list for the spontaneous buffer

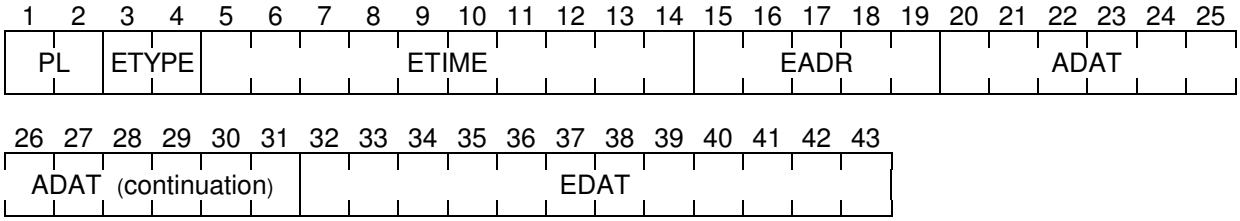
The markings used in the following tables mean:

Mark	Explanation
✪	Spontaneous buffer entries that correspond to the marked table addresses and table addresses 802-08 and 802-09 are 43 bytes long. The unmarked table addresses are 51 bytes long The table values also exist with older software versions. ADAT and EDAT are 16 digits.

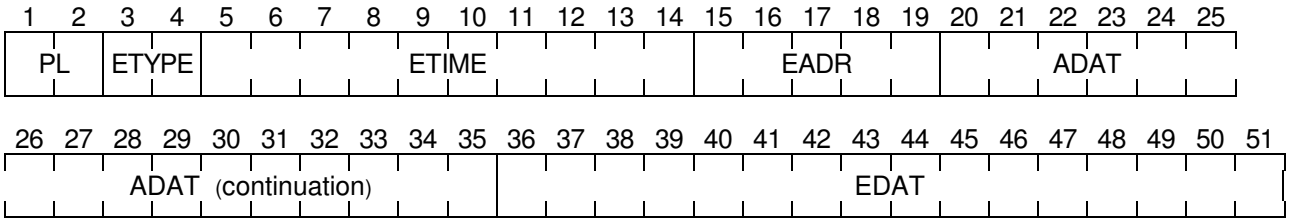
Address			Explanation
✪	051	-xx	Status change (xx = serial number)
	109	-00	Maximum reset
	400	-xx	Sign for input xx (assignment of the summation registers)
	600	-00	Number of inputs
	600	-01	Number of summation registers
	600	-02	Tariff rate settings (number of energy/number of demand tariffs)
	601	-00	Activation status of inputs 1 to 8
	601	-01	Activation status of inputs 9 to 16
	601	-02	Activation status of inputs 17 to 24
	601	-03	Activation status of inputs 25 to 32
	602	-zz	Numerator for meter input zz (zz = 1 to 32, energy)
	603	-zz	Denominator for meter input zz (zz = 1 to 32, energy)
	604	-zz	Numerator for meter input zz (zz = 1 to 32, demand)
	605	-zz	Denominator for meter input zz (zz = 1 to 32, demand)
	607	-xx	Pulse output matching for summation register xx (xx = 1 to 8)
	61y	-00	Common denominator for energy summation register y (y = 1 to 8)
	61y	-xx	Numerator for input xx (xx = 1 to 32) for energy summation register y (y = 1 to 8)
	62y	-00	Common denominator for demand summation register y (y = 1 to 8)
	62y	-xx	Numerator for input xx (xx = 1 to 32) for demand summation register y (y = 1 to 8)
	660	-00	Activation status of the logical inputs
	700	-12	DataFW4 equipment
	700	-13	DataFW4 CPU version
✪	701	-01	Measuring period duration change
	800	-01	Protocol change (FC01, VU26, on version 4.10)
✪	802	-01	Subposition number change
	802	-08	Subposition number for CB-01
	802	-09	Subposition number for CB-02
✪	803	-00	Change of baud rate for SCTM protocol
	803	-01	Change of baud rate for DIN 19244
	804	-01	Change of the number of decades for a demand value (SCTM protocol)
✪	821	-xx	Assignment CB-01: xx=00 for channel 1 to 8, xx=01 for channel 9 to 16, xx=02 for channel 17 to 24, xx=03 for channel 25 to 32, xx=04 for summation register 1 to 8
✪	822	-xx	Assignment CB-02: xx=00 for channel 1 to 8, xx=01 for channel 9 to 16, xx=02 for channel 17 to 24, xx=03 for channel 25 to 32, xx=04 for summation register 1 to 8
	860	-00	Change in print options
✪	900	-00	Password entry
	901	-00	Radio clock reception on/off
	998	-00	Change in the number of seconds that must be set for SSYN (T2)
	998	-01	Change in the number of seconds that must be set for MSYN (T3)
	998	-02	Change in the number of seconds that must be set for ZSYN (T4)

Spontaneous buffer entries have 3 formats:

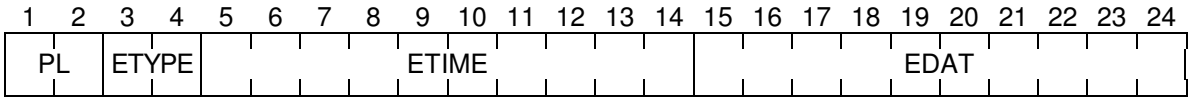
1st format:



2nd format:



3rd format:



Explanation::

PL	packet length: 1st format: PL = 43 characters, 2nd format: PL = 51 characters, 3rd format: PL = 24 characters
ETYPE	event type
ETIME	event time
EADR	event addres.
ADAT	old data (information.)
EDAT	new data (information)

Data formats:

1. PL 2 characters.
2. ETYPE
   - category A: change of status
     - A1: alarm
     - A3 power down
   - category C: set (change) of parameter
     - C1: set before locates
     - C2: set by remote parametrization
   - category D: set time
     - D1: set time before locates
     - D2: set time by remote parametrization
     - D3: change winter time to summer time
     - D4: change summer time to winter time
3. ETIME YY MM DD hh mm (YY = year, MM = month, DD = day, hh = hour, mm = minute)
4. EADR address: see address list for SCTM
5. ADAT data (information): see address list and table value for SCTM
6. EDAT data (information): see address list and table value for SCTM

Assignment of the cyclic buffers

Cyclic buffer CB-01:

821.00	C8	C7	C6	C5	C4	C3	C2	C1
821.01	C16	C15	C14	C13	C12	C11	C10	C9
821.02	C24	C23	C22	C21	C20	C19	C18	C17
821.03	C32	C31	C30	C29	C28	C27	C26	C25
821.04	Σ 8	Σ 7	Σ 6	Σ 5	Σ 4	Σ 3	Σ 2	Σ 1

For summation balance calculation:

821.04	Σ 4-	Σ 4+	Σ 3-	Σ 3+	Σ 2-	Σ 2+	Σ 1-	Σ 1+

Cyclic buffer CB-02:

822.00	C8	C7	C6	C5	C4	C3	C2	C1
822.01	C16	C15	C14	C13	C12	C11	C10	C9
822.02	C24	C23	C22	C21	C20	C19	C18	C17
822.03	C32	C31	C30	C29	C28	C27	C26	C25
822.04	Σ 8	Σ 7	Σ 6	Σ 5	Σ 4	Σ 3	Σ 2	Σ 1

For summation balance calculation:

822.04	Σ 4-	Σ 4+	Σ 3-	Σ 3+	Σ 2-	Σ 2+	Σ 1-	Σ 1+

Cx ⇨ Channel no. x

Σ x ⇨ Sum x

Σ x+ ⇨ Sum x import

Σ x- ⇨ Sum x export

Treatment of the cyclic buffers on time setting and power failure

Example: Measuring period duration: 15 minutes
Starting time of the measurement: 16.01.1995 at 10:00 hrs.
Time setting from: 14:13 hrs.
to: 14:52 hrs.
or
Power failure from: 14:13 hrs.
to: 14:53 hrs.

Explanation: In this case the metered values are set to 0 for the measuring period entries from 14:15, 14:30 and 14:45 and the NP bit is set in the SCTM device status.
If you have reset the time over a number X of minutes (X is calculated from the size of the cyclic buffer in measuring period multiplied by the measuring period duration in minutes) or if there was a power failure for this time period, the cyclic buffers are cleared.

Deviations from the standard SCTM protocol

In the following points the DataFW4 - SCTM protocol differs from the standard SCTM protocol:

- There are 12 and 16-digit table addresses.
- If an intermediate time has been specified for BUFENQ1 for which no buffer entry is made, the previous packet is transmitted.
- For example: for a measuring period of 15 minutes the current measuring period is scanned at 14:17 hrs.. The unit then transmits the measuring period that was terminated at 14:15 hrs..
- With BUFENQ2 every data block contains precisely one measuring period.
- With TABSET1 the switchover times for summer/winter time and winter/summer time cannot be parameterized by the remote metering centre but only the data whose table addresses are marked with "*" in table address list (see section C.1.4.)
- In addition to the spontaneous buffer entries that are 23 or 43 bytes long, there are also spontaneous buffer entries that are 51 bytes long.

The DataFW4 supports the following SCTM telegrams:

BUFENQ1 (E4)	Retrieval of individual buffer entries.
NEXTi (E5)	Retrieval of the following buffer entry.
BUFENQ2 (E6)	Retrieval of a continuous block of data from a load profile buffer.
NEXTBLOCK (HEADER)	Retrieval of the following data block.
TABENQ1 (E1)	Retrieval of listed table addresses.
TABENQ3 (E3)	Retrieval of date and time (resolution in seconds)
SETTIME (T1)	Sets the time to be programmed into the DataFW4.
SSYNC (T2)	Change the time in the DataFW4 to the previously set time. Year, month, day, hour and minute will be changed to the values set with the SETTIME command, seconds will be set to 0 (see 998-00).
MSYNC (T3)	Synchronize (hour)
MSYNC (T4)	Synchronize (minute) The seconds will be set to 0. If the second value was between 30 and 59, the minute value will be increased.
TABSET1 (S1)	Remote program change (set table addresses). Currently only the logic outputs can be set (address 661-nn).

LSV1 procedure

The LSV1 procedure with error detection and correction can be used instead of the SCTM protocol for transmission of commands and data. The LSV1 procedure is based on the German standards DIN 66003, DIN 66019, DIN 66219 and the international standards ISO 646, ISO 1745, ISO 1177, ISO 1155 and ISO 2628.

! The LSV1 protocol stipulates that time setting on the end of an integration period causes the cyclic buffers to be cleared. The cyclic buffers are not cleared by physical deletion but by setting of markings.

Example 1:

Measuring period duration: 15 minutes
Time setting from: 14:12 hrs.
to: 14:17 hrs.

The cyclic buffers are cleared in the LSV1 protocol. In the SCTM protocol the cyclic buffers would not be cleared because the markings used are different.

Example 2:

Measuring period duration: 15 minutes
Start of measurement: 13:00 hrs.
Time setting from: 14:12 hrs.
to: 14:17 hrs.

Storage of the first measuring period: 13:15 hrs.

The following situations could occur:

1. The unit is set to SCTM protocol at the time the time is set.
   The cyclic buffers are not cleared for the SCTM protocol.
   The unit displays 14:31 hrs. for example, then when the oldest integration period is interrogated the values of the measuring period that ended at 13:15 hrs. is displayed. Now switch to the LSV1 procedure and you also obtain the measuring period that ended at 13:15 hrs. as the oldest measuring period in the cyclic buffer.
   Because the SCTM protocol was active at the time the time was set, the periodic buffer was not cleared.
2. The unit is set to LSV1 protocol at the time the time is set.
   The cyclic buffers are only marked as deleted for the LSV1 procedure.
   This means that on the scan for LSV1 at 14:31 hrs. the measuring period that terminated at 14:31 hrs. is the oldest measuring period in the cyclic buffer. If you now switch to SCTM you obtain the measuring period that terminated at 13:15 hrs. as the oldest measuring period in the cyclic buffer.

The above procedure was chosen to ensure that if the time is accidentally beyond the end of the measuring period, the cyclic buffers are not physically deleted and the data lost. The data can be read again by switching back to the SCTM protocol.

Device status in the measuring period block

The LSV1 device status consists of 2 characters. The following bits are set:

1st character (1st byte)							2nd character (2nd byte)						
1	0	0	T-Bit	U-Bit	M-Bit	Alarm	1	0	0	TS-Bit	0	T1-Bit	T2-Bit

Meaning of the bits:

Status	Bit	Content	Explanation
1st byte	Bit 6	1	Not used
	Bit 5	0	Not used
	Bit 4	0	Not used
	Bit 3	T-Bit	On time setting and summer time switchover
	Bit 2	U-Bit	On time setting and power failure
	Bit 1	M-Bit	On change of buffer assignment, measuring period duration, equipment ID, baud rate
	Bit 0	A-Bit Alarm	Alarms if at least one bit is set in the measuring status byte 1 to byte 3 (bits 0 to 3)
2nd byte	Bit 6	1	Not used
	Bit 5	0	Not used
	Bit 4	0	Not used
	Bit 3	TS-Bit	Measured value marking MRK
	Bit 2	0	Not used
	Bit 1	T1-Bit	Tariff bit 2 TR2
	Bit 0	T2-Bit	Tariff bit 1 TR1

Example:

Status	Bit	Explanation
@ @	100 0000 100 0000	OK
A @	100 0001 100 0000	Alarms (A-Bit=1)
B C	100 0010 100 0011	Parameter change, Tariff bits (T1-Bit=1, T2-Bit=1)
D @	100 0100 100 0000	On time setting and power failure (U-Bit=1)

Metered value status in the integration period block

For every input in the cyclic buffer, a 1 byte long metered value status is generated.

1st character (1st byte)						
1	0	0	0	Bit 2	0	0

In the LSV1 metered value status only bit 2 is set on a power failure (:= 1).

Calculation of the current date

Because the year is not contained in the LSV1 telegrams, the year is calculated by the following rules:

- Interrogation of the cyclic buffer
- Interrogation of the spontaneous buffer

Interrogation of the cyclic buffer

To assert the current year, the cyclic buffer is interrogated according to the following criteria:

- If a measuring period entry exists for the date contained in the LSV1 telegram and the year of the last measuring period entry in the cyclic buffer, the year of the last measuring period entry is accepted.
- If **no** measuring period entry exists for the date contained in the LSV1 telegram of the year of the last measuring period entry in the cyclic buffer but an entry exists for the year before this year is accepted.
- If no measuring period entry exists in the cyclic buffer either for the date contained in the LSV1 telegram or for the year of the last measuring period or for the year before the following applies:
  - if the date is up to 60 days from the date of the last measuring period in the future it is assigned to the future.
  - if the date is more than 60 days from the date of the latest future measuring period, it is assigned to the past.

Transmission of the meter values

The LSV1 procedure stipulates 6 decades per meter value for transmission. At present the demand values are only stored with 4 decades on the MSC01, FC01 and VU26 board. This means that 4-decade values are transmitted right justified.

IEC60870-5-102 protocol

The following sections describe the data format of the telegrams for communication with the protocol IEC60870-5-102.

Restrictions

- Data format: 8, E, 1 (1 start bit, 8 data bits, 1 parity bit-even, 1 stop bit).
- Transmission frame format (IEC60870-5-1): format FT 1.2 supported only.
- Link transmission procedures (see part 5 from IEC60870-5-2). Basic polling procedure with request/respond (function code 11) is supported.
- Length of link address is 2 bytes (fix).
- The ASDU address is equal with the link address (2 bytes).
- The maximal length of telegrams is 256 byte.
- The sequence number (application layer) is always equal 0.
- No answer by fault telegram.

Interrogation of the cyclic buffer

Following inquiry are possible: last measuring period (:= class 2), oldest measuring period, specific past measuring period and manufacturer specification.

Status of telegrams (IEC60870-5-3/4):

- All values are accounting integrated totals: energy or maximum demand (see DMFPARA: "Buffer values").
- Measuring period 1 (Tm1) is supported only.
- For sequence of values see next page.

Note: All values are 32 bit long (4 octets)!

Selection of ASDU

Interrogation of follow ASDU (application service data unit) is possibly:

- Process information (monitoring direction):

☒ <1> := Single-point information with time tag
☒ <2> := Accounting integrated totals with 4 octets
☒ <5> := Periodically reset accounting integrated totals with 4 octets (Firmware from Version 11.2001 up)

- System information (monitoring direction):

☒ <70> := End of initialization
☒ <71> := Maufacturer and product specification

- System information (control direction):

☒ <100>:= Read maufacturer and product specification
☒ <104>:= Read accounting integrated totals of the oldest integration period
☒ <106>:= Read accounting integrated totals of a specific past integration period
☒ <108>:= Read periodically reset accounting integrated totals of the oldest integration period (Firmware from Version 11.2001 up)
☒ <110>:= Read periodically reset accounting integrated totals of a specific past integration period (Firmware from Version 11.2001 up)

List address

Interrogation of follow list address is possibly:

☒ <0> := Default (spontaneous single-point information)
☒ <11> := List address for integrated totals of integration period 1 (Tm1)

Sequence of values (1 to 32)

- Cyclic buffer 1 (CB-01):
  - inputs: _____ (e.g. Inp1, Inp2, Inp3, Inp4, …)
  - sums: _____ (e.g. Σ1+, Σ1-, Σ2+, Σ2-, …)
- Cyclic buffer 2 (CB-02):
  - inputs: _____ (e.g. Inp1, Inp2, Inp3, Inp4, …)
  - sums: _____ (e.g. Σ1+, Σ1-, Σ2+, Σ2-, …)

1	01_{Hex}	Input __ / Sum __
2	02_{Hex}	Input __ / Sum __
3	03_{Hex}	Input __ / Sum __
4	04_{Hex}	Input __ / Sum __
5	05_{Hex}	Input __ / Sum __
6	06_{Hex}	Input __ / Sum __
7	07_{Hex}	Input __ / Sum __
8	08_{Hex}	Input __ / Sum __
9	09_{Hex}	Input __ / Sum __
10	$0A_{Hex}$	Input __ / Sum __
11	$0B_{Hex}$	Input __ / Sum __
12	$0C_{Hex}$	Input __ / Sum __
13	$0D_{Hex}$	Input __ / Sum __
14	$0E_{Hex}$	Input __ / Sum __
15	$0F_{Hex}$	Input __ / Sum __
16	10_{Hex}	Input __ / Sum __
17	11_{Hex}	Input __ / Sum __
18	12_{Hex}	Input __ / Sum __
19	13_{Hex}	Input __ / Sum __
20	14_{Hex}	Input __ / Sum __
21	15_{Hex}	Input __ / Sum __
22	16_{Hex}	Input __ / Sum __
23	17_{Hex}	Input __ / Sum __
24	18_{Hex}	Input __ / Sum __
25	19_{Hex}	Input __ / Sum __
26	$1A_{Hex}$	Input __ / Sum __
27	$1B_{Hex}$	Input __ / Sum __
28	$1C_{Hex}$	Input __ / Sum __
29	$1D_{Hex}$	Input __ / Sum __
30	$1E_{Hex}$	Input __ / Sum __
31	$1F_{Hex}$	Input __ / Sum __
32	20_{Hex}	Input __ / Sum __

Link layer:

Variable telegram:

Start 68 $_{Hex}$
Length field L
Length field L
Start 68 $_{Hex}$
Control field C
Address field A (2 bytes)
Data
Check sum
End 16 $_{Hex}$

Fix telegram:

Start 10 $_{Hex}$
Control field C
Address field A (2 bytes)
Check sum
End 16 $_{Hex}$

Single character:

E5 $_{Hex}$

Note: Address field A (2 bytes) = Link address = ASDU address

Interrogation of the spontaneous-buffer

IEC format		Information
SPA (hex)	SPQ (hex)	
02	01	CPU-EPROM faulty
02	02	Internal CPU error
02	03	Fault in the internal CPU RAM
03	01	Power failure
04	40	MemoryCard battery flat (replace battery immediately!)
05	01	Pulse output overflow – SUM1
05	02	Pulse output overflow – SUM2
05	03	Pulse output overflow – SUM3
05	04	Pulse output overflow – SUM4
05	05	Pulse input overflow (energy)
05	06	Pulse input overflow (maximum demand)
07	01	The radio clock has not send the time to the CPU for 24 hour
07	03	Summer time switch over: winter to summer
07	04	Summer time switch over: summer to winter
07	05	Time setting
08	11	Read or write error on the MSC01/DS01/FC01/VU25/VU26
08	12	No MemoryCard/diskette inserted
08	13	MemoryCard not formatted or not correctly inserted
08	16	RAM overflow
08	1A	Diskette 100% or 95% full
08	1E	Diskette/MemoryCard is write-protected
0F	01	Parameters changed

Restrictions:

- The removal of a error is not shown.
- After a switch of the protocol or power failure spent the entire spontaneous-buffer again!
- By the time information: seconds and milliseconds are equal 0.
- SPI-Bit is always set (single-point information = ON).

Load prognosis (load check)

As an option DataFW4 can be equipped with additional RS232 interface for 30sec/1min load check:

- The 30sec load prognosis (load check) is a scan of the instantaneous values of the summation registers (maximum demand) according to DIN 19244, Part 52.
- The 1min load prognosis (load check; Firmware from Version 11.2001 up) is a scan of the instantaneous values of the summation registers (energy) according to IEC60870-5-102.

The station address (1 byte), baud rate and number of values to be transmitted is set in the parameterization software DMFPARA. See the separate description of DMFPARA for further details. The description for the load check can be ordered separately.

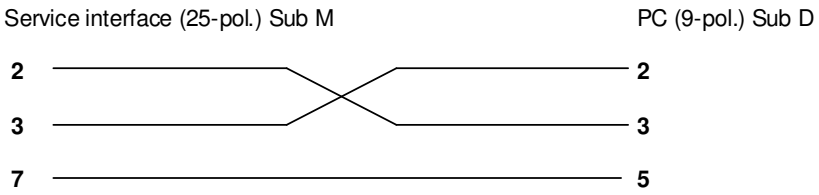
Appendix B

Register Addresses

Service interface description

It is possible to read out or change register contents via the interface next to the keypad using any RS232 read out programs (after entering a password). Transmission is serial (8, n, 1) with a fixed baud rate (9600 baud) via a straight connected interface cable (e.g. modem cable).

The parameterization software DMFPARA must be used to parameterize the DATA FW unit. The software ensures that consecutive register addresses are set in the correct sequence. No responsibility is accepted for malfunctions in units caused by incorrect parameterization.



Register addresses for the ROLL (ANZ) display

This section contains lists of all internal register addresses that can be retrieved via the ANZ key list (ROLL menu).

The markings in the following table mean:

° Value can be parameterized

§ Value can NOT be parameterized while measurement is in progress

$ Hexadecimal value

% Binary value

Fault display for ROLL (ANZ) key mode

Display text	Explanation
02 Addr. invalid	Register address unknown
03 SubAddr. ???	Sub address unknown
07 Tariff ???	Tariff does not exist
13 No Connect !	Internal connection of metered value processing missing
19 No HW Feature	Hardware characteristic missing (e.g. control inputs, control outputs, printer, radio clock)

Meter status in ROLL (ANZ) key mode

Bit	Mask (hex)	Meaning
0000 0000	$00	Register non activated! (sleep mode)
0000 0001	$01	Register overflow
0000 1000	$08	Register active
0001 0000	$10	Register for heat meter

Times

Address	Description	Value range	After reset
° 000-00	Current date with time in the format YYYY-MM-TT.hh.mm.ss	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1994-01-01.00:00:00
010-00	Date/time of last measuring period 1	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1980-01-01.00:00:00
030-00	Date/time of last power failure	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1980-01-01.00:00:00
031-00	Date/time of last power recovery	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1980-01-01.00:00:00
040-00	Date/time of last maximum reset	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1980-01-01.00:00:00
040-01 to 040-12	Date/time of last 12 maximum resets	1980-01-01.00:00:00 to 2400-01-01.00:00:00	1980-01-01.00:00:00

Meter register (results)

For the register addresses 100-xx to 130-xx and 300-xx to 305-xx the following sub addresses are possible:

Sub address: 00 .. 63 Meter register (pulse inputs): Inputs 01 .. 64 (depends on the configuration of the unit)
64 .. 71 Summation registers import: Sum 01 .. 08+
72 .. 79 Summation registers export: Sum 01 .. 08-

Address	Description	Value range	After reset
° 100-xx	Energy value cumulative total and meter status (status only on interrogation))	0 to 99999999	00000000[1]
° 10t-xx	Energy value cumulative for tariffs 1 .. 8 (t=1..8) and meter status	0 to 99999999	00000000
11t-xx	Energy value flow since the last reset for tariff rate <t> (running value)	0 to 99999999	00000000
120-xx	Total demand value (last measuring period) (xx=00..79) and meter status	0 to 9999	0000
130-xx	Total demand value: current meter reading (xx=00..79) and meter status	0 to 9999	0000
14t-xx	Energy value cumulative total (t=0) and for tariffs 1 .. 8 (t=1..8) and meter status (last measuring period)	0 to 99999999	00000000
180-xx	Mean power factor of the latest minute (xx=00..03)	0 to 1.000	1.000
181-xx	Mean power factor of the latest measuring period (xx=00..03)	0 to 1.000	1.000
182-xx	Lowest power factor MP mean value since last reset (xx = 00 .. 03)	0 to 1.000	1.000
190-xx	Master sum (power generation, see 311-04) xx=00: sum 1+ active export, actually day (daily energy) xx=01: sum 1- active import (daily energy) xx=02: sum 2+ reactive export (daily energy) xx=03: sum 2- reactive import (daily energy) xx=10..13: actually month (monthly energy)	0 to 99999999	00000000

[1] The meter status also appears after the meter register state in the display (see 4.4.2.15).

Pulse processing

Parameters for the pulse inputs: sub addresses: xx = 00 to 63

Address	Description	Value range	After reset
° 200-xx	Pulse debounce for input xx (minimum ON phase in 10 ms)	1 to 200	3
° 201-xx	Pulse debounce for input xx (minimum OFF phase in 10 ms)	1 to 200	3
° 202-xx	Maximum pulse ON phase in 10 ms (0 means monitoring off)	2 to 200	0
° 205-xx	Activation of channel xx	1 = on , 0 = off	0
° 206-xx	Heat demand calculator parameter for channel xx	If no telegrams arrive within one minute the status message "No data !" is output.	0000000
° 210-xx to 273-xx	Input weighting (numerator) of summation register xx; 210-xx applies to input 1; 273-xx to input 64 Sub address: 00 .. 07: summation register energy 16 .. 23: summation register demand	-99999999 to 99999999	0
° 280-xx	Hysteresis of summation register xx (xx = 00 .. 07)	0 to 99999999	0
° 281-xx	Number of the output terminal of energy summation register xx	[1]	equipment-specific
° 281-20 to 281-22	Number of the output terminal of tariff rate output 1 to 3	[1]	99
° 281-30	Number of the output terminal of output MPA (on version 1.36 and higher)	[1]	equipment -specific
° 287-xx	Active power input for power factor nr. xx (xx=00..03)	00..63: meter register 64..71: sum import 72..79: sum export	287 - 00 : 0 - 01 : 2 - 02 : 4 - 03 : 6
° 288-xx	Reactive power input for power factor nr. xx (xx=00..03)	00..63: meter register 64..71: sum import 72..79: sum export	288 - 00 : 1 - 01 : 3 - 02 : 5 - 03 : 7
° 289-xx	Integration time for power factor	1 to 60	5
290-xx	ON time for pulse output of sum xx in 10 ms, min. 10 ms (xx=00..15)	1 to 200	9
° 291-xx	OFF time for pulse output of sum xx in 10 ms (xx=00..15)	1 to 200	11
° 292-xx	Pulse matching denominator for output of sum xx (xx=00..15)	0 to 99999999	0
° 300-xx	Pulse matching energy meter / numerator (xx=00..79, see address 100-00)	0 to 99999999	1
° 301-xx	Pulse matching energy meter / denominator	1 to 99999999	1
° 302-xx	Pulse matching demand meter / numerator	0 to 99999999	1
° 303-xx	Pulse matching demand meter / denominator	1 to 99999999	1
° 304-xx	Read constants for energy	1 to 99999999	1
° 305-xx	Read constants for demand	1 to 99999999	1
°§ 310-00	Number of inputs processed (number of energy and demand registers)	1 to 48 with maximum configuration [1]	specific [1]

[1] This value range depends on the number of pulse inputs and outputs.

Pulse processing Parameters for the pulse inputs: sub addresses: xx = 00 to 63				
°§	310-01	Number of sums calculated for energy and demand	0 to 8 with maximum configuration [1]	specific [1]
°§	310-02	Number of power factor calculations	0 to 4	0
°§	310-03	Summation balance calculations on or off	1 = on , 0 = off	0
°	311-00	Polarity of output MPA	0 = std. , 1 = invert	0
°	311-01	Apply energy meter register from heat meter	0 = on , 1 = off	0
°	311-02	Heat meters type	0 = Calec MB/ST… , 1 = Autarkon	0
°	311-03	Load prognosis (DIN19244): FCB/FCV invert	0 = std. , 1 = invert	0
°	311-04	Master sum (for power generation only) sum 2 (reactive energy) = function of sum 1 (active energy)	0 = off. , 1 = on	0
°	311-05	Number of characters for printing	0 to 250	0 (:= 80 characters)
°	311-06	Load prognosis: DIN19244 or IEC60870	0 = DIN… , 1 = IEC...	0
°	311-07	free	0	0

Maxima

Address	Description	Value range	After restart
40t-xx	Current maximum and time of demand meter xx for tariff rate t (t=0..3) Sub address: 00 .. 63 Register (Pulse inputs) This value depends on the configuration of the equipment. 64 .. 71 Summation registers import 72 .. 79 Summation registers export	./.	0 1980-01-01.00:00:00
4nt-xx	Store data for maximum resets: maximum and time of demand meter xx for tariff rate t (t=0..3) or energy value cumulative and flow total (t=4) and for tariffs 1 .. 4 (t=5 .. 8) n = 1..9 the last 9 resets Sub address: see 40t-xx	./.	0 1980-01-01.00:00:00

Registers

Address	Description	Value range	After restart
600-00	Number of decades for all energy registers	./.	8
600-01	Number of decades for all demand registers	./.	4

Control inputs and outputs			
Address	**Description**	**Value range**	**After restart**
° 640-01	Display after reset	1 = on , 0 = off	1
° 640-02	Reset possible via keypad or SERVICE	1 = on , 0 = off	0
° 640-03	Reset time controlled; no reset, for 00-00-00 Time of reset: YY-MM-TT.hh:mm:00 with Joker * e.g. **-**-01.00:00:00=1st of each month, 00:00 o'clock;	see addr. 000-00	00-00-00
640-04	Status of the internal reset counter	0..11	0
° 640-05	User parameterizable reset counter 1..12	1 to 12	1
° 640-06	Reset disable in measuring period, only affects MP1	1 to 100	3
° 640-07	RSTX1/2 active	1 = an , 0 = off	1
° 640-08	ABL active	1 = an , 0 = off	0
640-09	Number of MP's since last reset	0 to 99999999	0
640-10	Number of reset since beginning of measurement	0 to 99999999	0
640-11	Reset counter 0..99	0 to 99	1
640-12	Physical input of RSTX1	equipment-specific	equipment-specific
640-13	Physical input of RSTX2	equipment-specific	equipment-specific
640-14	Physical input of ABL	equipment-specific	equipment-specific
° 641-00	SYN active	1 = an , 0 = off	1
° 641-01	Range for SYN in seconds	0 to 29	29
° 641-02	SYN polarity	0=NC contact, 1=NO contact	1
641-03	Physical Input of SYN	equipment-specific	equipment-specific
° 642-00	ROLL (ANZ) active	1 = on , 0 = off	0
° 642-01 to 642-50	List of the table addresses for ROLL (ANZ)	00000 to 99999 or -1 (unused entry)	-1
° 642-51	Duration of ROLL switching in sec; (Values from 0 to 240; 0=OFF, Default=0)	0 to 240	0
642-52	Physical input of ROLL (ANZ)	equipment-specific	equipment-specific

Control inputs and outputs			
Address	**Description**	**Value range**	**After restart**
° 643-00	Tariff rate control on/off	1 = on , 0 = off	1
° 643-01	Tariff rate control via TR1/2/3 and MRK (=0), via internal tariff rate calendar (=1) or OR combination of external and internal tariff rate bits (=2).	0 to 2	0
° 643-02	MRK active	1 = an , 0 = off	0
°§ 643-03	Number of energy tariff rates	0 to 4	4
°§ 643-04	Number of demand tariff rates	0 to 4	4
° 643-05	Mask for energy tariff rate (Bit pattern: Bit3=TR3, 2=TR2, 1=TR1, 0=MRK)	0 to 15	%110
° 643-06	Mask for demand tariff rate (Bit pattern: Bit3=TR3, 2=TR2, 1=TR1, 0=MRK)	0 to 15	%110
° 643-10 to 643.25	Table for the assignment of the state inputs TR3..1 and MRK to the current energy tariff rate	0 to 7 (depending on the maximum number of tariffs)	
° 643-10	Tariff if TR3=0, TR2=0, TR1=0, MRK=0	0 to 7	0
° 643-11	Tariff if TR3=0, TR2=0, TR1=0, MRK=1	0 to 7	0
° 643-12	Tariff if TR3=0, TR2=0, TR1=1, MRK=0	0 to 7	1
° 643-13	Tariff if TR3=0, TR2=0, TR1=1, MRK=1	0 to 7	1
° 643-14	Tariff if TR3=0, TR2=1, TR1=0, MRK=0	0 to 7	2
° 643-15	Tariff if TR3=0, TR2=1, TR1=0, MRK=1	0 to 7	2
° 643-16	Tariff if TR3=0, TR2=1, TR1=1, MRK=0	0 to 7	3
° 643-17	Tariff if TR3=0, TR2=1, TR1=1, MRK=1	0 to 7	3
° 643-18	Tariff if TR3=1, TR2=0, TR1=0, MRK=0	0 to 7	4
° 643-19	Tariff if TR3=1, TR2=0, TR1=0, MRK=1	0 to 7	4
° 643-20	Tariff if TR3=1, TR2=0, TR1=1, MRK=0	0 to 7	5
° 643-21	Tariff if TR3=1, TR2=0, TR1=1, MRK=1	0 to 7	5
° 643-22	Tariff if TR3=1, TR2=1, TR1=0, MRK=0	0 to 7	6
° 643-23	Tariff if TR3=1, TR2=1, TR1=0, MRK=1	0 to 7	6
° 643-24	Tariff if TR3=1, TR2=1, TR1=1, MRK=0	0 to 7	7
° 643-25	Tariff if TR3=1, TR2=1, TR1=1, MRK=1	0 to 7	7
° 643-30 to 643-45	Table for the assignment of the state of the inputs TR3..1 and MRK to the current demand tariff	0 to 7 (depending on maximum number of tariffs)	
° 643-30	Tariff if TR3=0, TR2=0, TR1=0, MRK=0	0 to 7	0
° 643-31	Tariff if TR3=0, TR2=0, TR1=0, MRK=1	0 to 7	0
° 643-32	Tariff if TR3=0, TR2=0, TR1=1, MRK=0	0 to 7	1
° 643-33	Tariff if TR3=0, TR2=0, TR1=1, MRK=1	0 to 7	1

Control inputs and outputs			
Address	**Description**	**Value range**	**After restart**
° 643-34	Tariff if TR3=0, TR2=1, TR1=0, MRK=0	0 to 7	2
° 643-35	Tariff if TR3=0, TR2=1, TR1=0, MRK=1	0 to 7	2
° 643-36	Tariff if TR3=0, TR2=1, TR1=1, MRK=0	0 to 7	3
° 643-37	Tariff if TR3=0, TR2=1, TR1=1, MRK=1	0 to 7	3
° 643-38	Tariff if TR3=1, TR2=0, TR1=0, MRK=0	0 to 7	4
° 643-39	Tariff if TR3=1, TR2=0, TR1=0, MRK=1	0 to 7	4
° 643-40	Tariff if TR3=1, TR2=0, TR1=1, MRK=0	0 to 7	5
° 643-41	Tariff if TR3=1, TR2=0, TR1=1, MRK=1	0 to 7	5
° 643-42	Tariff if TR3=1, TR2=1, TR1=0, MRK=0	0 to 7	6
° 643-43	Tariff if TR3=1, TR2=1, TR1=0, MRK=1	0 to 7	6
° 643-44	Tariff if TR3=1, TR2=1, TR1=1, MRK=0	0 to 7	7
° 643-45	Tariff if TR3=1, TR2=1, TR1=1, MRK=1	0 to 7	7
643-46	Physical input of TR1	equipment-specific	equipment-specific
643-47	Physical input of TR2	equipment-specific	equipment-specific
643-48	Physical input of TR3	equipment-specific	equipment-specific
643-49	Physical input of MRK	equipment-specific	equipment-specific
° 644-00	MPA active	1 = on , 0 = off	0
° 644-01	Active time of MPA in steps of 200 ms	1 to 100	1
° 645-00	Logical inputs activated	1 = on , 0 = off	0
645-01	State of the logical inputs (bit pattern, most significant bit left)	./.	depending on the state of inputs
645-02 to 645-05	Physical input of logical input 1 to 4.	equipment-specific	equipment-specific
° 647-00	Tariff rate outputs activated	1 = on , 0 = off	0
° 647-01 to 647-64	Bit pattern for the tariff outputs	0 to 15	specific [1]
° 648-xx	Text for Roll display; xx=00..49	any ASCII text, length up to 8 characters	no text
690-00	Current state of the inputs RSTX1/2, SYN, MRK, ABL, ROLL (ANZ), TR1/2/3 (32 bit binary)	./.	depending on the state of inputs

Equipment information			
Address	**Description**	**Value range**	**After restart**
700-00	Equipment name	./.	equipment-specific
700-01	Version	./.	version-specific
700-02	Version date	./.	version-specific
700-04	ROM identification	equipment-specific	equipment-specific
700-09	Equipment configuration	./.	equipment-specific
° 700-10	Equipment designation	ASCII string 16 characters	"DATA FW 0448" or "DATA FW 0432V" or "DATA FW 0432C"
° 700-11	Equipment status	Write into this register address resets the equipment status to 0	$0
700-12	Status of the first FC/MSC (identification "a") in the equipment	(depends on the state of the equipment)	$0
700-13	Status of the second FC/MSC or V1 (identification "b") in the equipment (if present otherwise $0 always returned).	(depends on the state of the equipment)	$0
700-14	Status of the third FC/MSC or V1 (identification "c") in the equipment (if present otherwise $0 always returned).	(depends on the state of the equipment)	$0
700-15	SCTM status of the first FC/MSC (identification "a").	(depends on the state of the equipment)	$0
700-16	SCTM status of the second FC/MSC or V1 (identification "b") in the equipment (if present otherwise $0 always returned).	(depends on the state of the equipment)	$0
700-17	SCTM status of the third FC/MSC or V1 (identification "c") in the equipment (if present otherwise $0 always returned).	(depends on the state of the equipment)	$0
700-19	Printer status	(depends on the state of the equipment)	$0
700-20	Current energy tariff rates of the four tariff rate calendars if tariff rate calendars are activated otherwise four times the tariff rate value of the tariff rate inputs	0 to 7	depends on the state of the tariff rate inputs or the tariff rate calendar
700-21	Current demand tariffs of the four tariff rate calendars if the tariff rate calendars are activated otherwise four times the tariff rate value of the tariff rate inputs	0 to 7	depends on the state of the tariff rate inputs or the tariff rate calendar
700-22	Measurement status	0=idle, 1=measurement, 2=start, 3=recording interruption	0

Equipment information			
Address	**Description**	**Value range**	**After restart**
700-30	Information via the first FC/MSC (identification "a").	./.	equipment -specific
700-31	Information about the second FC/MSC or V1 (identification "b") in the equipment (if present otherwise alarm)	./.	equipment -specific
700-32	Information about the third FC/MSC or V1 (identification "c") in the equipment (if present otherwise alarm)	./.	equipment -specific

Time parameter			
Address	**Description**	**Value range**	**After restart**
°§ 701-00	Duration of the recording interval (integration period) 1 in minutes	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60	15
° 702-00	Starting time for measurement (if not in the IP time base rounded)	see address 000-00	1980-01-01.00:00:00
° 703-00	Sliding measuring period: number of measuring periods	0 to 60	0
° 704-xx	Table for summer time switchover: beginning (time is put forward 1h) (xx=00..04)	see address 000-00	1980-01-01.00:00:00
° 705-xx	Table for summer time switchover: end (time is put back 1h) (xx=00..04)	see address 000-00	1980-01-01.00:00:00
	Caution! The tables for the beginning and end of summer time must be parameterized in winter time. They must be set up before the clock after a RESET. Always set both tables.		

Tariff rate control			
Address	**Description**	**Value range**	**After restart**
° 707-xx	Assignment of input or sum (energy) to one of the four tariff rate calendars (value range for xx see register address 100-00)	0 to 3; 0=Tariff cal. 1, 3=Tariff cal. 4	0
° 708-xx	Assignment of input or sum (demand) to tariff rate calendar (value range 0..3, Default=0) (Value range for xx see register address 100-00)	0 to 3; 0= Tariff cal. 1, 3= Tariff cal. 4	0
° 709-xx	Public holiday definition (x=00..99); even sub address = holiday type; odd SA = associated date; The public holiday definitions apply to all tariff rate calendars. The year must be in the range 1980..2099. Instead of a fixed year you can enter **. The public holiday then applies to every year.	even addr.: 0 to 7 odd addr.: see addr.000-00	even addr: 5 odd addr.: 80-00-00
° 710-xx	Beginning of the six seasons (xx=01..06) of tariff rate calendar 1 in format MM-DD.hh:mm. The values for hours and minutes (hh:mm) are ignored. The season always begin at 00:00. If 00-00:00:00 is entered this identifies an unused season entry. All valid season entries of the table must be at the beginning of the table.	00-00:00:00 to 31-12:00:00	00-00.00:00
° 711-xx	Day of week program definition of the seasons (xx=01..06) of tariff rate calendar 1	in each of the 8 positions: Value from $1 to $F	11111111

Tariff rate control

	Address	Description	Value range	After restart
°	712-xx to 726-xx	Daily tariff rate tables (xx=00..15) of tariff rate calendar 1; the sub addresses determine the tariff rates and the associated switching times. The entries must be ordered by hours. Unused entries must be placed at the end; the tariff, hour and minute value must 00.	see Section Tariff rate calendar	00,00:00
°	730-xx	Season definition of tariff rate calendar 2 (xx=01..06) see addr. 710-xx	00-00:00:00 to 31-12:00:00	00-00.00:00
°	731-xx	Day of the week program definition tariff rate calendar 2 (xx=01..06) see addr. 711-xx	in each of the 8 positions: Value from $1 to $F	00,00:00
°	732-xx to 746-xx	Daily tariff rate tables (xx=00..15) for tariff rate calendar 2; the sub addresses determine the tariffs and the associated switching times see addr. 712-xx	see Section Tariff rate calendar	00,00:00
°	750-xx	Season definition of tariff rate calendar 3 (xx=01..06) see addr. 710-xx	00-00:00:00 to 31-12:00:00	00-00.00:00
°	751-xx	Day of the week program definition tariff rate calendar 3 (xx=01..06) see addr. 711-xx	in each of the 8 positions: Value from $1 to $F	00,00:00
°	752-xx to 766-xx	Daily tariff rate tables (xx=00..15) for tariff rate calendar 3; the sub addresses determine the tariffs and the associated switching times see addr. 712-xx	see section tariff rate calendar	00,00:00
°	770-xx	Season definition of tariff rate calendar 4 (xx=01..06) see addr. 710-xx	00-00:00:00 to 31-12:00:00	00-00.00:00
°	771-xx	Day of the week program definition tariff rate calendar 4 (xx=01..06) see addr. 711-xx	on each of the 8 positions: value $1 to $F	00,00:00
°	772-xx to 786-xx	Daily tariff rate tables (xx=00..15) for tariff rate calendar 4; the sub addresses determine the tariff rates and the associated switching times see addr. 712-xx	see Section Tariff rate calendar	00,00:00

Communication parameters

	Address	Description	Value range	After restart
	800-00	Communication on/off	./.	1
°	800-01	Protocol type	0=SCTM, 1=LSV1	0
	802-00	Number of decades of the sub position number	./.	5
°	802-01	Equipment identification (the first five figures are used as SCTM sub position numbers)	0000000000000000 9999999999999999	0000000000000000
°	802-02	Equipment identification for reading out cyclic buffer 1 ("AAAAAAAAAAAAAAAA" means inactive)	see addr. 802-01	AAAAAAAAAAAAAAAA
°	802-03	Equipment identification for reading out cyclic buffer 2 ("AAAAAAAAAAAAAAAA" means inactive)	see addr. 802-01	AAAAAAAAAAAAAAAA
	802-09	Length of the data block for TABENQ, TABSET	./.	16
°	803-01	Baud rate for SCTM interface	300, 600, 1200, 2400, 4800, 9600	2400
	803-02	Baud rate for service interface	./.	9600

Communication parameters

Address	Description	Value range	After restart
°§ 803-03	Baud rate for 30 sec load check	300, 600, 1200, 2400, 4800, 9600	2400
804-00	Maximum data block length for SCTM	./.	255
804-01	Number of decades of the demand values transmitted via SCTM	4 or 6	6
° 805-00	Station address for load control	0 to 254; 0=load check off	0
° 805-01	Number of transmitted values for load check	1 to 8	4
° 811-00	Received disable time in 10 ms (only for half duplex mode);	0, 3 to 255 0=full duplex mode	0
° 811-01	Transmit delay time in 10 ms (only for half-duplex mode)	0, 3 to 255 0=full duplex mode	0
° 811-02	Disconnection time after modem inactivity (in 10 ms)	0, 10 to 15300	0

Measured value memory

Address	Description	Value range	After restart
821-bb	Assignment of measured value memory 1 (Bit pattern)	%00000000 to %11111111	
°§ 821-00	Demand register, input 1..8	0 to 255	0
°§ 821-01	Register, input 9..16	0 to 255	0
°§ 821-02	Register, input 17..24	0 to 255	0
°§ 821-03	Register, input 25..32	0 to 255	0
°§ 821-04	Register, input 33..40	0 to 255	0
°§ 821-05	Register, input 41..48	0 to 255	0
°§ 821-08	Demand summation registers 1..8, import	0 to 255	0
°§ 821-09	Demand summation registers 1..8, export	0 to 255	0
822-bb	Assignment of measured value memory 2 (Bit pattern)	%00000000 to %11111111	
°§ 822-00	Demand register, Input 1..8	0 to 255	0
°§ 822-01	Register, input 9..16	0 to 255	0
°§ 822-02	Register, input 17..24	0 to 255	0
°§ 822-03	Register, input 25..32	0 to 255	0
°§ 822-04	Register, input 33..40	0 to 255	0
°§ 822-05	Register, input 41..48	0 to 255	0
°§ 822-08	Demand summation registers 1..8, import	0 to 255	0
°§ 822-09	Demand summation registers 1..8, export	0 to 255	0

Printer				
Address		Description	Value range	After restart
°	861-00	Title for list 1	ASCII text, 32 characters	"---- List 1 -----"
°	861-01	Title for list 2	ASCII text, 32 characters	"---- List 2 -----"
°	862-01	Print info on start of measurement	1 = on , 0 = off	0
°	862-02	Printing time for list 1	0 = never, 1 = daily, 2 = monthly, 3 = at end of Mp1, 4 = on reset	0
°	862-03	Printing time for list 2	see addr. 862-02	0
°	862-04	Printing time for reset list	see addr. 862-02	4
°	862-05	Prints measured value list 1 with/without meter numbers	1 = on , 0 = off	0
°	862-07	Print demand in list 1 with/without meter numbers	1=with, 0= without	0
°	862-08	Print demand in list 2 with/without meter numbers	1= with, 0= without	0
°	863-xx	Identification text for the energy values and sums for printout of start/end lists, lists 1 and 2 and reset list. For sub address xx the same values apply as for address 100-xx.	any ASCII text, length max. 25 characters	no text
°	870-00	Printer on/off	1 = on , 0 = off	
°	871-00	List 1: Bit pattern for energy register to be printed, input 1..8	0 to 255	0
°	871-01	List 1: Bit pattern for energy register to be printed, input 9..16	0 to 255	0
°	871-02	List 1: Bit pattern for energy register to be printed, input 17..24	0 to 255	0
°	871-03	List 1: Bit pattern for energy register to be printed, input 25..32	0 to 255	0
°	871-04	List 1: Bit pattern for energy register to be printed, input 33..40	0 to 255	0
°	871-05	List 1: Bit pattern for energy register to be printed, input 41..48	0 to 255	0
°	871-08	Energy sum 1..8, import	0 to 255	0
°	871-09	Energy sum 1..8, export	0 to 255	0
°	872-00	List 1: Bit pattern for demand register to be printed, input 1..8	0 to 255	0
°	872-01	List 1: Bit pattern for demand register to be printed, input 9..16	0 to 255	0
°	872-02	List 1: Bit pattern for demand register to be printed, input 17..24	0 to 255	0
°	872-03	List 1: Bit pattern for demand register to be printed, input 25..32	0 to 255	0
°	872-04	List 1: Bit pattern for demand register to be printed, input 33..40	0 to 255	0
°	872-05	List 1: Bit pattern for demand register to be printed, input 41..48	0 to 255	0
°	872-08	Demand sum 1..8, import	0 to 255	0
°	872-09	Demand sum 1..8, export	0 to 255	0

Printer

Address	Description	Value range	After restart
○ 872-10	Power factor 0..3 - Value of the last MP (bits 0 ..3)	0 to 15	0
○ 873-00	List 2: Demand sum, input 1..8	0 to 255	0
○ 873-01	List 2: Bit pattern for demand register to be printed, input 9..16	0 to 255	0
○ 873-02	List 2: Bit pattern for demand register to be printed, input 17..24	0 to 255	0
○ 873-03	List 2: Bit pattern for demand register to be printed, input 25..32	0 to 255	0
○ 873-04	List 2: Bit pattern for demand register to be printed, input 33..40	0 to 255	0
○ 873-05	List 2: Bit pattern for demand register to be printed, input 41..48	0 to 255	0
○ 873-08	Energy sum 1..8, import	0 to 255	0
○ 873-09	Energy sum 1..8, export	0 to 255	0
○ 874-00	List 2: Bit pattern for demand register to be printed, input 1..8	0 to 255	0
○ 874-01	List 2: Bit pattern for demand register to be printed, input 9..16	0 to 255	0
○ 874-02	List 2: Bit pattern for demand register to be printed, input 17..24	0 to 255	0
○ 874-03	List 2: Bit pattern for demand register to be printed, input 25..32	0 to 255	0
○ 874-04	List 2: Bit pattern for demand register to be printed, input 33..40	0 to 255	0
○ 874-05	List 2: Bit pattern for demand register to be printed, input 41..48	0 to 255	0
○ 874-08	Energy sum 1..8, import	0 to 255	0
○ 874-09	Energy sum 1..8, export	0 to 255	0
○ 874-10	Power factor value of the last MP (bits 0 ..3)	0 to 15	0

Bit patterns

Address	Description	Value range	After restart
○ 875-00	Measured value printout for MP1: bit pattern for demand register to be printed, input 1..8	0 to 255	255
○ 875-01	Measured value printout for MP1: bit pattern for demand register to be printed, input 9..16	0 to 255	255
○ 875-02	Measured value printout for MP1: bit pattern for demand register to be printed, input 17..24	0 to 255	255
○ 875-03	Measured value printout for MP1: bit pattern for demand register to be printed, input 25..32	0 to 255	255
○ 874-04	Measured value printout for MP1: bit pattern for demand register to be printed, input 33..40	0 to 255	255
○ 875-05	Measured value printout for MP1: bit pattern for demand register to be printed, input 41..48	0 to 255	255
○ 875-08	Demand sum 1..8, import	0 to 255	255
○ 875-09	Demand sum 1..8, export	0 to 255	255
○ 876-00	Measured value printout for MP2: bit pattern for demand register to be printed, input 1..8	0 to 255	255
○ 876-01	Measured value printout for MP2: bit pattern for demand register to be printed, input 9..16	0 to 255	255

Bit patterns			
Address	**Description**	**Value range**	**After restart**
° 876-02	Measured value printout for MP2: bit pattern for demand register to be printed, input 17..24	0 to 255	255
° 876-03	Measured value printout for MP2: bit pattern for demand register to be printed, input 25..32	0 to 255	255
° 876-04	Measured value printout for MP2: bit pattern for demand register to be printed, input 33..40	0 to 255	255
° 876-05	Measured value printout for MP2: bit pattern for demand register to be printed, input 41..48	0 to 255	255
° 876-08	Demand sum 1..8, import	0 to 255	255
° 876-09	Demand sum 1..8, export	0 to 255	255
° 877-00	Reset list: bit pattern for energy register to be printed, input 1..8	0 to 255	0
° 877-01	Reset list: bit pattern for energy register to be printed, input 9..16	0 to 255	0
° 877-02	Reset list: bit pattern for energy register to be printed, input 17..24	0 to 255	0
° 877-03	Reset list: bit pattern for energy register to be printed, input 25..32	0 to 255	0
° 877-04	Reset list: bit pattern for energy register to be printed, input 33..40	0 to 255	0
° 877-05	Reset list: bit pattern for energy register to be printed, input 41..48	0 to 255	0
° 877-08	Energy sum 1..8, import	0 to 255	0
° 877-09	Energy sum 1..8, export	0 to 255	0
° 878-00	Reset list: bit pattern for demand maximum register to be printed, input 1..8	0 to 255	0
° 878-01	Reset list: bit pattern for demand maximum register to be printed, input 9..16	0 to 255	0
° 878-02	Reset list: bit pattern for demand maximum register to be printed, input 17..24	0 to 255	0
° 878-03	Reset list: bit pattern for demand maximum register to be printed, input 25..32	0 to 255	0
° 878-04	Reset list: bit pattern for demand maximum register to be printed, input 33..40	0 to 255	0
° 878-05	Reset list: bit pattern for demand maximum register to be printed, input 41..48	0 to 255	0
° 878-08	Demand sum 1..8, import	0 to 255	0
° 878-09	Demand sum 1..8, export	0 to 255	0
° 878-10	Power factor smallest MP mean value since last reset (bits 0 ..3)	0 to 15	0
° 879-xx	Printout of the energy tariff register in beginning list, end list, lists 1 and 2, reset list. A number is passed that is interpreted as a bit pattern. Bit 0 corresponds to tariff register 1, bit 1 to tariff register 2 etc. If the bit is set, the tariff register is printed.. For subaddress xx the same values applies as for address 100-xx.	0 to 255	255
° 880-xx	Printout of the maximum demand tariff register in reset list. See address 879-xx.	0 to 255	255
881-00	List 1: Bit pattern for energy to be printed since last reset Register, input 1..8	0 to 255	0

Bit patterns			
Address	**Description**	**Value range**	**After restart**
881-01	List 1: Bit pattern for energy to be printed since last reset Register, input 9..16	0 to 255	0
° 881-02	List 1: Bit pattern for energy to be printed since last reset Register, input 17..24	0 to 255	0
° 881-03	List 1: Bit pattern for energy to be printed since last reset Register, input 25..32	0 to 255	0
° 881-04	List 1: Bit pattern for energy to be printed since last reset Register, input 33..40	0 to 255	0
° 881-05	List 1: Bit pattern for energy to be printed since last reset Register, input 41..48	0 to 255	0
° 881-08	Energy sum 1..8, import	0 to 255	0
° 881-09	Energy sum 1..8, exports	0 to 255	0

Bit patterns			
Address	**Description**	**Value range**	**After restart**
° 882-00	List 2: Bit pattern for energy to be printed since last reset Register, input 1..8	0 to 255	0
° 882-01	List 2: Bit pattern for energy to be printed since last reset Register, input 9..16	0 to 255	0
° 882-02	List 2: Bit pattern for energy to be printed since last reset Register, input 17..24	0 to 255	0
° 882-03	List 2: Bit pattern for energy to be printed since last reset Register, input 25..32	0 to 255	0
° 882-04	List 2: Bit pattern for energy to be printed since last reset Register, input 33..40	0 to 255	0
° 882-05	List 2: Bit pattern for energy to be printed since last reset Register, input 41..48	0 to 255	0
° 882-08	Energy sum 1..8, import	0 to 255	0
° 882-09	Energy sum 1..8, export	0 to 255	0
° 883-00	Reset list: bit pattern for energy to be printed since last reset Register, input 1..8	0 to 255	0
° 883-01	Reset list: bit pattern for energy to be printed since last reset Register, input 9..16	0 to 255	0
° 883-02	Reset list: bit pattern for energy to be printed since last reset Register, input 17..24	0 to 255	0
° 883-03	Reset list: bit pattern for energy to be printed since last reset Register, input 25..32	0 to 255	0
° 883-04	Reset list: bit pattern for energy to be printed since last reset Register, input 33..40	0 to 255	0
° 883-05	Reset list: bit pattern for energy to be printed since last reset Register, input 41..48	0 to 255	0
° 883-08	Energy sum 1..8, import	0 to 255	0
° 883-09	Energy sum 1..8, export	0 to 255	0

Miscellaneous

	Address	Description	Value range	After restart
	900-00	Last password entered was correct or incorrect	0=incorrect, 1=correct	0
	900-01	Last FC/MSC message with error	./.	00000000
	900-04	Date/time of last NAK/timeout from FC/MSC	./.	1994-01-01.00:00:00
°	901-00	Radio clock reception on/off	1 = on , 0 = off	
°	901-02	Summer time switchover on/off	1 = on , 0 = off	0
°	901-03	Summer time switchover controlled by radio clock	1 = on, 0 = off	0
°	901-04	Evaluate radio clock receiver at SYN input on/off	1 = on, 0 = off	0
°	902-00	Language	0=english, 1=German, 2=French, 3=Dutch	0
°	903-00	Password for parameterization and end of program (can only be read during parameterization)	string up to 8 characters	12345
°	903-01	Password for maximum demand reset (can only be read during parameterization)	see addr 903-00	12345
°	903-02	Password for data medium change (can only be read during parameterization)	see addr 903-00	12345
°	903-03	Password for RESTART (can only be read during parameterization)	see addr 903-00	12345
°	999-99	Display test	none	none

Appendix C

Parameter List
and
Constant Sheets

Parameter List

☐ **DataFW4/DATAREG 48**	☐ **DLC32/DATAREG 32C**	Responsible:	Date:
Station:		**Equipment identification:** _ _ _ _ _ _ _ _ _ _ _ _	

Equipment identification		_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _							
Baud Rate	**Com 1**	RS232/FG/Modem/M-Bus – SCTM/LSV1/IEC60870: Baud							
	Com 2	RS232/FG/Modem – SCTM/LSV1/IEC60870/DIN19244: Baud							
Number of input channels									
Number of sums		Sum difference [ ]							
Outputs (function)		1:	2:	3:	4:	5:	6:	7:	8:
Mode of operation	**Energy tariffs**		**Tariff calendar**		T1:				
	MD tariffs				T2:				
MD resets		Nr.: RSTX/Keyboard/Periodic:							
Measuring period Tm		min							
Load check (30sec/1min)		DIN 19244/IEC-60870 Number of values: Station address:							
Initialization date/time									
Periodic buffer 1		Inputs: Sums:							
Periodic buffer 2		Inputs: Sums:							

Pulse rates:	Energy/Work	Maximum demand/Power
	$\frac{Xw}{Yw} = \frac{W}{R \times Kw}$	$\frac{Xp}{Yp} = \frac{W \times 60}{R \times Kp \times Tm}$

Pulse output:	$x = \frac{Yws}{Rs \times Ks}$

Hysteresis (import/export)	$Lws = 2 \times (\sum Xws)$

Maximum pulse frequency Σ - output	$f_{max}[Hz] = P_{max}[kW] \times Rs\,[pul/kWh] \times \frac{1}{3600}[h/s]$

W: Transformer constant (U_{prim}/U_{sek} x I_{prim}/I_{sek})
R: Meter constant
w: work (energy)
K: Read constant
Tm: Measuring period
p: power (MD)

☐ **DataFW4/DATAREG 48**	☐ **DLC32/DATAREG 32C**	Responsible:	Date:
Station:		**Equipment identification:** _ _ _ _ _ _ _ _ _ _ _ _

Input channel		Reading constant			Meter/transformer constant		Energy		Power	
		P_{max}	Kw	Kp	R [Imp/kWh]	W	Xw	Yw	Xp	Yp
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
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24										
25										
26										
27										
28										
29										
30										
31										
32										

☐ **DataFW4/DATAREG 48**	☐ **DLC32/DATAREG 32C**	Responsible:	Date:
Station:		**Equipment identification:** _ _ _ _ _ _ _ _ _ _ _ _	

	Σ 1		Σ 2		Σ 3		Σ 4		Σ 5		Σ 6		Σ 7		Σ 8	
Input	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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27																
28																
29																
30																
31																
32																
Denominator (Ys)																
Read constant (Ks)																
Pulse constant Rs[pul/kWh]																
Maximum MD (P_{max})																
Pulse output (x)																
Hysteresis (Lws)																
Frequency (f_{max} [Hz])																

☐ **DataFW4/DATAREG 48**	☐ **DLC32/DATAREG 32C**	Responsible:	Date:
Station:		**Equipment identification:** _ _ _ _ _ _ _ _ _ _ _ _	

Scroll button list

Nr.	Address	Text	Info	Nr.	Address	Text	Info
1				26			
2				27			
3				28			
4				29			
5				30			
6				31			
7				32			
8				33			
9				34			
10				35			
11				36			
12				37			
13				38			
14				39			
15				40			
16				41			
17				42			
18				43			
19				44			
20				45			
21				46			
22				47			
23				48			
24				49			
25				50			

Templates for Constant Sheets for DataFW4 / DLC32

Depending on the device configuration one of the following templates can be used as constant sheet:

1) Devices with 8 inputs and 4 outputs max.
2) Devices with 16 inputs and 8 outputs max.
3) Devices with 32 inputs and 8 outputs max.
4) Devices with 48 inputs and 8 outputs max.

1) Constant sheet for devices with 8 inputs and 4 outputs max :

Pulse Input 1x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= .pulse/ NR.: V A C=		**Pulse Input 5x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=	
Pulse Input 2x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=		**Pulse Input 6x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=	
Pulse Input 3x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=		**Pulse Input 7x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=	
Pulse Input 4x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=		**Pulse Input 8x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=	
Sum 1 Out: pulse.-E C= **X**____ R= pulse./ _____V____Hz	Cl. /	**Sum 3** Out: pulse.-E C= **X**____ R= pulse./ _____V____Hz	Cl. /
Sum 2 out: pulse.-E C= **X**____ R= pulse./ _____V____Hz	Cl. /	**Sum 4** out: pulse.-E C= **X**____ R= pulse./ _____V____Hz	Cl. /
Device ID:			

2) Constant sheet for devices with 16 inputs and 8 outputs max :

Pulse Input 1x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to R= pulse./ NR.: V A C=		**Pulse Input 9x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 2x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 10x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 3x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 11x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 4x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 12x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 5x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 13x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 6x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 14x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 7x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 15x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Pulse Input 8x ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=		**Pulse Input 16x** ____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse./ NR.: V A C=	
Sum 1 out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /	**Sum 5** out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /
Sum 2 out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /	**Sum 6** out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /
Sum 3 out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /	**Sum 7** out: pulse-E C= **X**____ R= / _____V____Hz	Cl. /
Sum 4 out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /	**Sum 8** out: pulse-E C= **X**____ R= pulse/ _____V____Hz	Cl. /
Device ID:			

3) Constant sheet for devices with 32 inputs and 8 outputs max :

Pulse Input 1x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 17x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 2x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 18x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 3x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 19x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 4x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 20x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 5x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 21x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 6x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 22x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 7x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 23x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 8x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 24x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 9x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 25x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 10x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 26x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 11x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 27x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 12x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 28x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 13x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 29x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 14x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 30x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 15x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 31x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Pulse Input 16x____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=		**Pulse Input 32x**____ S0/bip.curr./wipe: _____V____Hz Cl. / belongs to: R= pulse/ NR.: V A C=	
Sum 1 out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /		**Sum 5** out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /	
Sum 2 out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /		**Sum 6** out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /	
Sum 3 out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /		**Sum 7** out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /	
Sum 4 out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /		**Sum 8** out: pulse-E C= **X**____ R= pulse/ _____V____Hz Cl. /	
Device ID:			

4) Constant sheet for devices with 48 inputs and 8 outputs max :

Pulse Input 1x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 25x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 2x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 26x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 3x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 27x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 4x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 28x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 5x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 29x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 6x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 30x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 7x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 31x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 8x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 32x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 9x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 33x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 10x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 34x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 11x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 35x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 12x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 36x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 13x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 37x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 14x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 38x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 15x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 39x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 16x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 40x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 17x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 41x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 18x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 42x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 19x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 43x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 20x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 44x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 21x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 45x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 22x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 46x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 23x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 47x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Pulse Input 24x ____	S0/bip.curr./wipe: _____V____Hz	Cl. /	**Pulse Input 48x** ____	S0/bip.curr./wipe: _____V____Hz	Cl. /
belongs to:	R= pulse/		belongs to:	R= pulse/	
NR.: ∞	V A C=		NR.: ∞	V A C=	
Sum 1	out: pulse-E C=		**Sum 5**	out: pulse-E C=	
X____	R= pulse/ _____V____Hz	Cl. /	**X**____	R= pulse/ _____V____Hz	Cl. /
Sum 2	out: pulse-E C=		**Sum 6**	out: pulse-E C=	
X____	R= pulse/ _____V____Hz	Cl. /	**X**____	R= pulse/ _____V____Hz	Cl. /
Sum 3	out: pulse-E C=		**Sum 7**	out: pulse-E C=	
X____	R= pulse/ _____V____Hz	Cl. /	**X**____	R= pulse/ _____V____Hz	Cl. /
Sum 4	out: pulse-E C=		**Sum 8**	out: pulse-E C=	
X____	R= pulse/ _____V____Hz	Cl. /	**X**____	R= pulse/ _____V____Hz	Cl. /
Device ID:					

Physikalisch-Technische Bundesanstalt

PTB

Braunschweig und Berlin

Innerstaatliche Bauartzulassung

Type-approval certificate under German law

Zulassungsinhaber:
Issued to:
Bär Industrie-Elektronik GmbH
Lange Straße 87
D-90762 Fürth

Rechtsbezug:
In accordance with:
§ 13 des Gesetzes über das Meß- und Eichwesen (Eichgesetz)
vom 23. März 1992 (BGBl. I S. 711)

Bauart:
In respect of:
Elektronische Zusatzeinrichtungen
DATA FW4
DLC 32
DATAREG 48
DATAREG 32C

Zulassungszeichen:
Approval mark:
00.23
98.07

Gültig bis:
Valid until:
unbefristet

Anzahl der Seiten:
Number of pages:
2

Geschäftszeichen:
Reference No.:
2.33-97001741-3649-2

Im Auftrag
By order
M. Kahmann

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 10

Braunschweig, 03.07.1998

Siegel
Seal

394 00 b

Merkmale zur Bauart sowie ggf. inhaltliche Beschränkungen, Auflagen und Bedingungen sind in der Anlage festgelegt, die Bestandteil der innerstaatlichen Bauartzulassung ist. Hinweise und eine Rechtsbehelfsbelehrung befinden sich auf der letzten Seite der Anlage.

Characteristics of the instrument type approved, restrictions as to the contents, special conditions and approval conditions, if any, are set out in the Annex which forms an integral part of the type-approval certificate under German law. For notes and information on legal remedies, see last page of the Annex

Appendix D

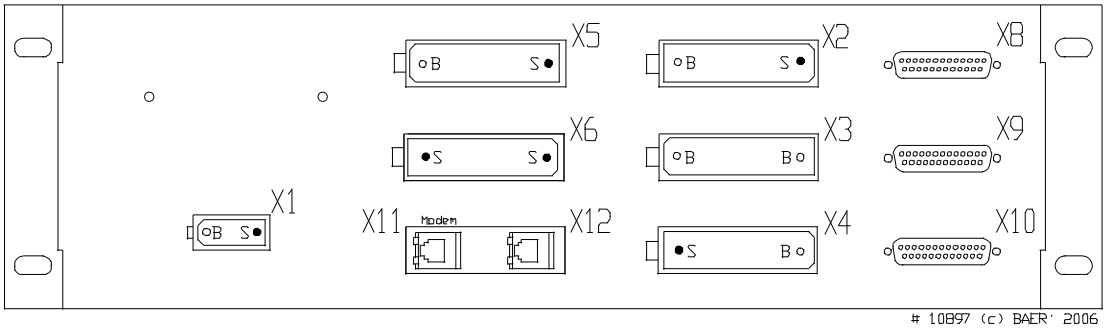
Terminal Assignments

Terminal View

Remark: The plug connectors are always at the back side of the 19“ rack.

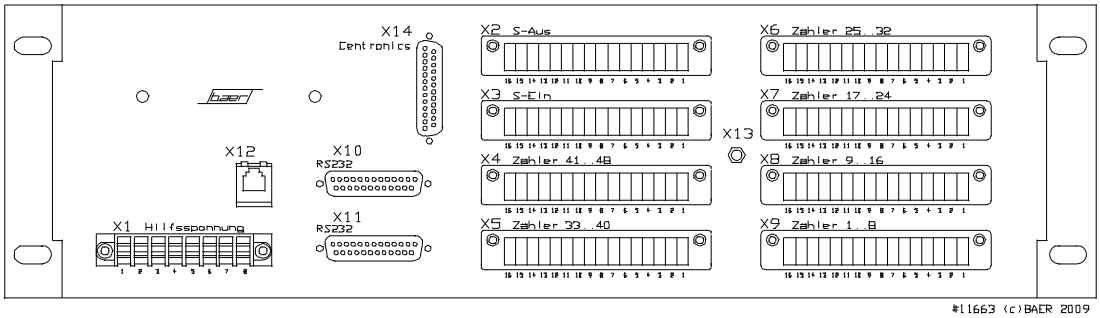
Type 1 / DIN

8 pins plug-in connector in compliance with DIN 41622
and
39 pins plug-in connector in compliance with DIN 41618
see page 3



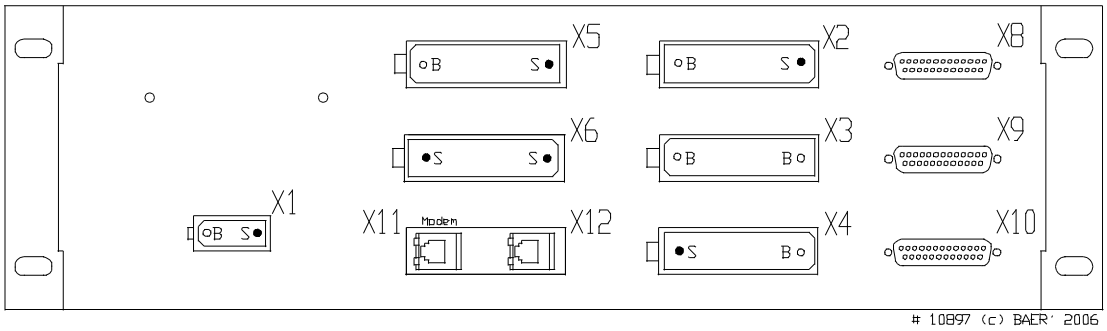
Type 2 / PHOENIX

Socket PHOENIX DFK4/8-G-7,62-LOE / Plug PHOENIX PC 4/8-ST-7,62
and
Socket PHOENIX DFK-MSTB 2,5/16-GF / Plug PHOENIX MSTB 2,5/16-ST
see page 14

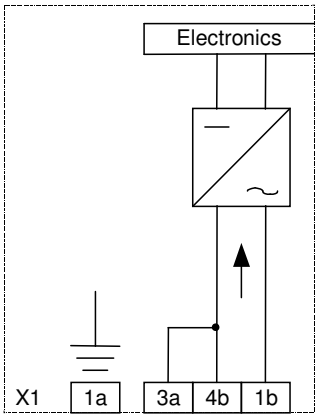


This document is valid only for devices without special terminal assignment diagram delivered.

Type 1 / DIN



Terminal Connector X1



Type: 8 pins DIN 41622

Purpose: Power supply connection DataFW4/DATAREG

Switched mode mains power supply: Alternating Current (AC): 110/230V supply voltage

Terminal	Label	
1a	PE	Protective Earth
1b	N	Neutral
3a - 4b	L1	Phase 110V/230VAC

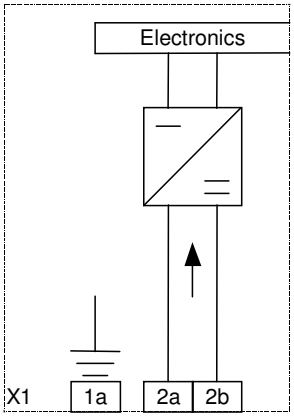
Selecting the Auxiliary Voltage

The auxiliary voltage connection (110/230VAC) is switched directly on the mains supply unit by turning the fuse around. Take out the mains supply unit while in a voltage-free state and plug the mains supply fuse into the correct plug-in place (make sure you have the correct current intensity)

.

Auxiliary Voltage	Fuse
110VAC	M 2.00A
230VAC	M 1.25A

! Important: Use fuses with correct current rating only.



Optional: Direct Current (DC): 60VDC Auxiliary Voltage (or 110VDC)

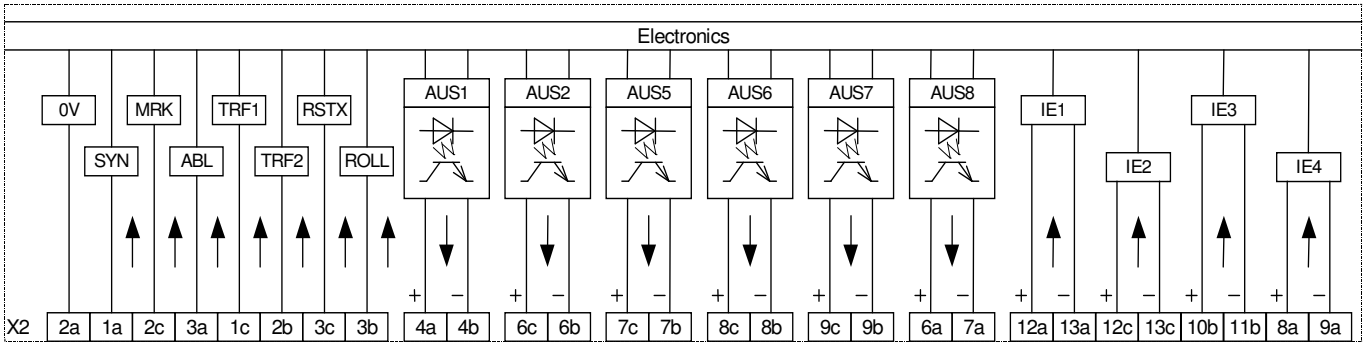
Terminal	Label	
1a	PE	Protective Earth
2a	GND1	0V of 60VDC Input Voltage (minus)
2b	+60VDC	Input Voltage (plus)

Terminal Connector X2

Type: 39 pins DIN 41618

Purpose: 7 control inputs (SSE) (only S0 inputs possible)
6 programmable control outputs (SSA)
4 pulse inputs (IE)

Terminal	Label		Description
Control signal inputs			
2a	0V	(SSE)	Common ground for control inputs
1a - 2a	SYN	(SSE)	External synchronization signal
2c - 2a	MRK	(SSE)	Measured value marking
3a - 2a	ABL	(SSE)	Maximum inhibit
1c - 2a	TRF1	(SSE)	Tariff rate input 1
2b - 2a	TRF2	(SSE)	Tariff rate input 2
3c - 2a	RSTX	(SSE)	External maximum reset signal
3b - 2a	ROLL (ANZ)	(SSE)	ROLL (ANZ) contact for display
Customer settable output terminals			
4a	AUS1 +	(SSA)	Output 1 IAW
4b	AUS1 -	(SSA)	Output 1 IAW
6c	AUS2 +	(SSA)	Output 2 IAW
6b	AUS2 -	(SSA)	Output 2 IAW
7c	AUS5 +	(SSA)	Output 5 IAW
7b	AUS5 -	(SSA)	Output 5 IAW
8c	AUS6 +	(SSA)	Output 6 IAW
8b	AUS6 -	(SSA)	Output 6 IAW
9c	AUS7 +	(SSA)	Output 7 IAW
9b	AUS7 -	(SSA)	Output 7 IAW
6a	AUS8 +	(SSA)	Output 8 IAW
7a	AUS8 -	(SSA)	Output 8 IAW
Pulse inputs 1 - 4			
12a	IE1 +	(IE)	Pulse input 1
13a	IE1 -	(IE)	Pulse input 1
12c	IE2 +	(IE)	Pulse input 2
13c	IE2 -	(IE)	Pulse input 2
10b	IE3 +	(IE)	Pulse input 3
11b	IE3 -	(IE)	Pulse input 3
8a	IE4 +	(IE)	Pulse input 4
9a	IE4 -	(IE)	Pulse input 4



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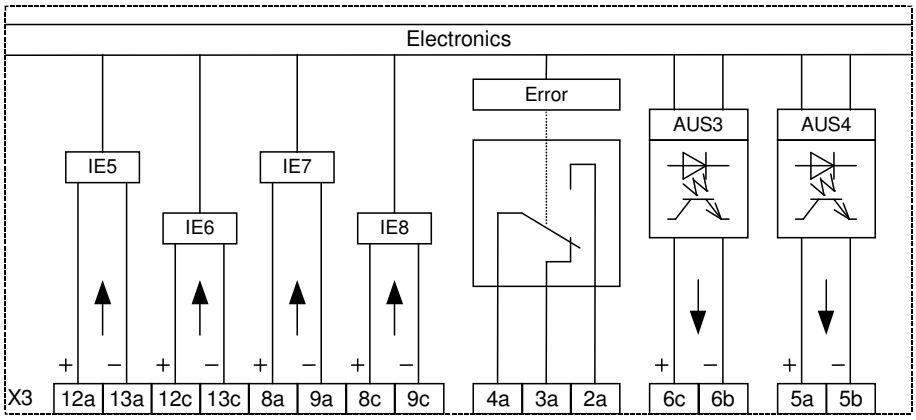
Terminal Connector X3

Typ: 39 pins DIN 41618

Purpose: 4 pulse inputs (IE)
2 customer settable output terminals (SSA)
Signal output error message relay (SSA)

Terminal	Label		Description
Pulse inputs 5 - 8			
12a	IE5 +	(IE)	Pulse input 5
13a	IE5 -	(IE)	Pulse input 5
12c	IE6 +	(IE)	Pulse input 6
13c	IE6 -	(IE)	Pulse input 6
8a	IE7 +	(IE)	Pulse input 7
9a	IE7 -	(IE)	Pulse input 7
8c	IE8 +	(IE)	Pulse input 8
9c	IE8 -	(IE)	Pulse input 8
Alarm relay			
4a	ERR (com)	(SSA)	Signal output COMMON
3a	ERR (no active)	(SSA)	Signal output ERROR (default)
2a	ERR (active)	(SSA)	Signal output NO ERROR
Customer settable output terminals			
6c	AUS3 +	(SSA)	Output 3 IAW
6b	AUS3 -	(SSA)	Output 3 IAW
5a	AUS4 +	(SSA)	Output 4 IAW
5b	AUS4 -	(SSA)	Output 4 IAW

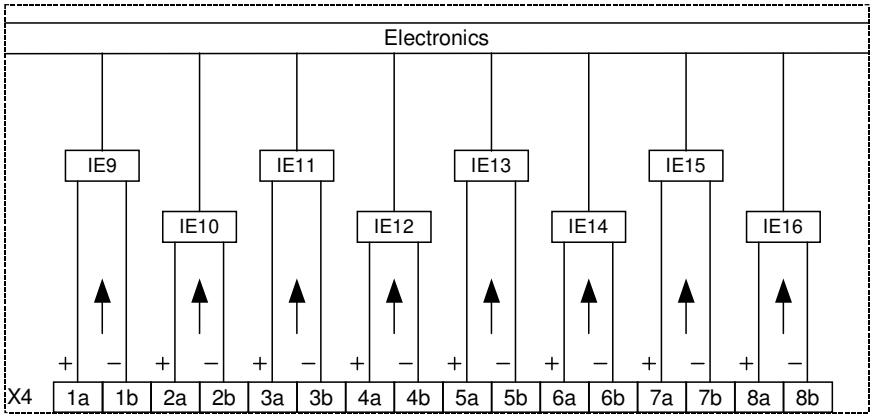


Terminal Connector X4

Type: 39 pins DIN 41618

Purpose: 8 pulse inputs (IE)

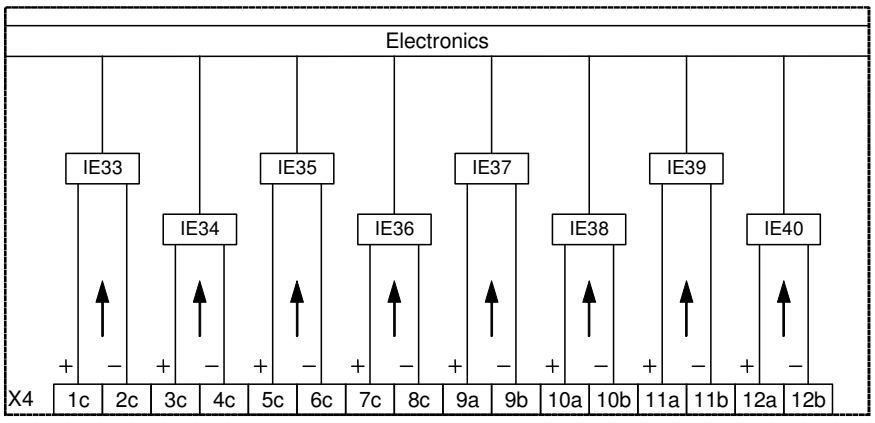
Terminal	Label		Description
Pulse inputs 9-16			
1a	IE9 +	(IE)	Pulse input 9
1b	IE9 -	(IE)	Pulse input 9
2a	IE10 +	(IE)	Pulse input 10
2b	IE10 -	(IE)	Pulse input 10
3a	IE11 +	(IE)	Pulse input 11
3b	IE11 -	(IE)	Pulse input 11
4a	IE12 +	(IE)	Pulse input 12
4b	IE12 -	(IE)	Pulse input 12
5a	IE13 +	(IE)	Pulse input 13
5b	IE13 -	(IE)	Pulse input 13
6a	IE14 +	(IE)	Pulse input 14
6b	IE14 -	(IE)	Pulse input 14
7a	IE15 +	(IE)	Pulse input 15
7b	IE15 -	(IE)	Pulse input 15
8a	IE16 +	(IE)	Pulse input 16
8b	IE16 -	(IE)	Pulse input 16



Terminal Connector X4 (continued)

Purpose: 8 pulse inputs (IE)

Terminal	Label		Description
Pulse inputs 33-40			
1c	IE33 +	(IE)	Pulse input 33
2c	IE33 -	(IE)	Pulse input 33
3c	IE34 +	(IE)	Pulse input 34
4c	IE34 -	(IE)	Pulse input 34
5c	IE35 +	(IE)	Pulse input 35
6c	IE35 -	(IE)	Pulse input 35
7c	IE36 +	(IE)	Pulse input 36
8c	IE36 -	(IE)	Pulse input 36
9a	IE37 +	(IE)	Pulse input 37
9b	IE37 -	(IE)	Pulse input 37
10a	IE38 +	(IE)	Pulse input 38
10b	IE38+	(IE)	Pulse input 38
11a	IE39 +	(IE)	Pulse input 39
11b	IE39 +	(IE)	Pulse input 39
12a	IE40 +	(IE)	Pulse input 40
12b	IE40 +	(IE)	Pulse input 40

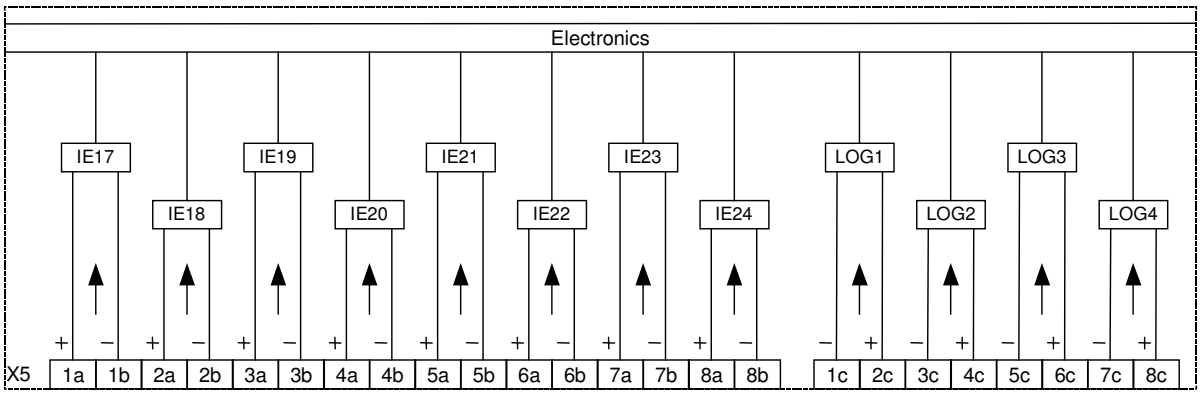


Terminal Connector X5

Type: 39 pins DIN 41618

Purpose: 8 pulse inputs (IE)
4 logical inputs (LE)

Terminal	Label		Description
Pulse inputs 17 - 24			
1a	IE17 +	(IE)	Pulse input 17
1b	IE17 -	(IE)	Pulse input 17
2a	IE18 +	(IE)	Pulse input 18
2b	IE18 -	(IE)	Pulse input 18
3a	IE19 +	(IE)	Pulse input 19
3b	IE19 -	(IE)	Pulse input 19
4a	IE20 +	(IE)	Pulse input 20
4b	IE20 -	(IE)	Pulse input 20
5a	IE21 +	(IE)	Pulse input 21
5b	IE21 -	(IE)	Pulse input 21
6a	IE22 +	(IE)	Pulse input 22
6b	IE22 -	(IE)	Pulse input 22
7a	IE23 +	(IE)	Pulse input 23
7b	IE23 -	(IE)	Pulse input 23
8a	IE24 +	(IE)	Pulse input 24
8b	IE24 -	(IE)	Pulse input 24
Logical inputs (LE)			
1c	LOG1 -	(LE)	Logical input 1
2c	LOG1 +	(LE)	Logical input 1
3c	LOG2 -	(LE)	Logical input 2
4c	LOG2 +	(LE)	Logical input 2
5c	LOG3 -	(LE)	Logical input 3
6c	LOG3 +	(LE)	Logical input 3
7c	LOG4 -	(LE)	Logical input 4
8c	LOG4 +	(LE)	Logical input 4

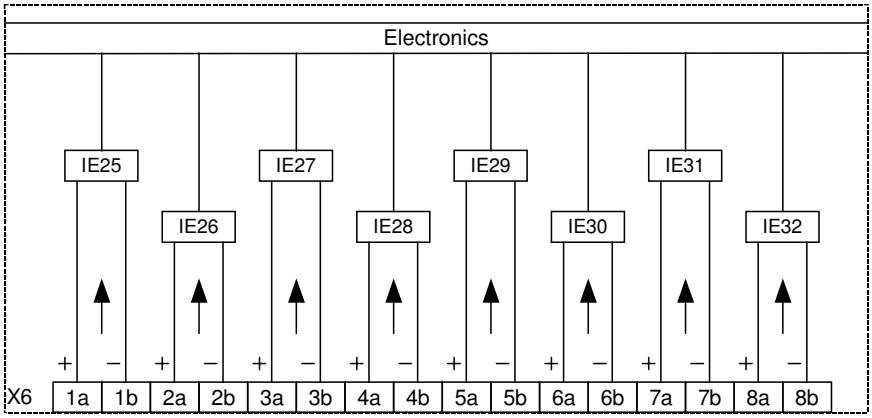


Terminal Connector X6

Type: 39 pins DIN 41618

Purpose: 8 pulse inputs (IE)

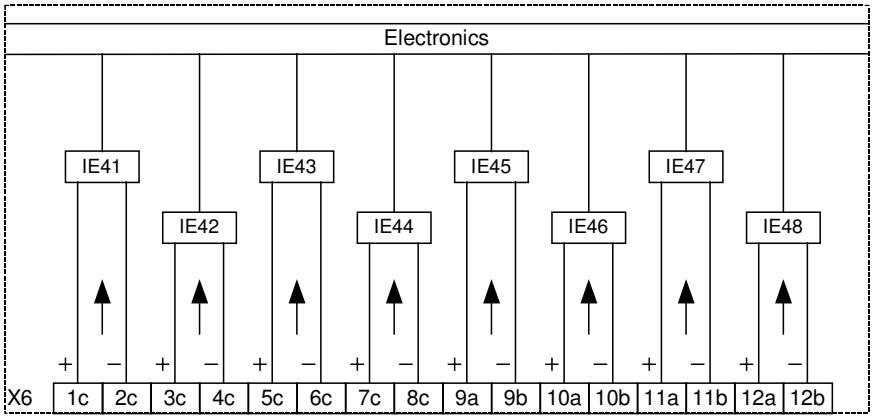
Terminal	Label		Description
Pulse inputs 25-32			
1a	IE25 +	(IE)	Pulse input 25
1b	IE25 -	(IE)	Pulse input 25
2a	IE26 +	(IE)	Pulse input 26
2b	IE26 -	(IE)	Pulse input 26
3a	IE27 +	(IE)	Pulse input 27
3b	IE27 -	(IE)	Pulse input 27
4a	IE28 +	(IE)	Pulse input 28
4b	IE28 -	(IE)	Pulse input 28
5a	IE29 +	(IE)	Pulse input 29
5b	IE29 -	(IE)	Pulse input 29
6a	IE30 +	(IE)	Pulse input 30
6b	IE30 -	(IE)	Pulse input 30
7a	IE31 +	(IE)	Pulse input 31
7b	IE31 -	(IE)	Pulse input 31
8a	IE32 +	(IE)	Pulse input 32
8b	IE32 -	(IE)	Pulse input 32



Terminal Connector X6 (continued)

Purpose: 8 pulse inputs (IE)

Terminal	Label		Description
Pulse inputs 41-48			
1c	IE41 +	(IE)	Pulse input 41
2c	IE41 -	(IE)	Pulse input 41
3c	IE42 +	(IE)	Pulse input 42
4c	IE42 -	(IE)	Pulse input 42
5c	IE43 +	(IE)	Pulse input 43
6c	IE43 -	(IE)	Pulse input 43
7c	IE44 +	(IE)	Pulse input 44
8c	IE44 -	(IE)	Pulse input 44
9a	IE45 +	(IE)	Pulse input 45
9b	IE45 -	(IE)	Pulse input 45
10a	IE46 +	(IE)	Pulse input 46
10b	IE46 -	(IE)	Pulse input 46
11a	IE47 +	(IE)	Pulse input 47
11b	IE47 -	(IE)	Pulse input 47
12a	IE48 +	(IE)	Pulse input 48
12b	IE48 -	(IE)	Pulse input 48



RS232 / V.24 – Socket X8 and X9

Type: 25-pin plug-in connector SUB-D in compliance with ISO 2110
Assignment V.24/RS232C/DIN 66020

Purpose: General RS232 interface, used e.g. for load prediction purposes.

Pin	Label		Description
2	TxD	Input	Transmit data
3	RxD	Output	Receive data
4	RTS	Input	Request to send
5	CTS	Output	Clear to send
7	GND		Signal-Ground

Centronics socket for external printer X10

Type: 25-way plug-in connector SUB-D female to ISO 2110

Purpose: Connection of a centronics compatible printer

Pin	Label	Description
1	Pstb	Data is valid
2	P0	Data line 0
3	P1	Data line 1
4	P2	Data line 2
5	P3	Data line 3
6	P4	Data line 4
7	P5	Data line 5
8	P6	Data line 6
9	P7	Data line 7
11	Pbusy	Printer message: busy
12	Pempty	Printer message: no paper
18	GND	Signal ground
19	GND	Signal ground
20	GND	Signal ground
21	GND	Signal ground
22	GND	Signal ground
23	GND	Signal ground
24	GND	Signal ground
25	GND	Signal ground

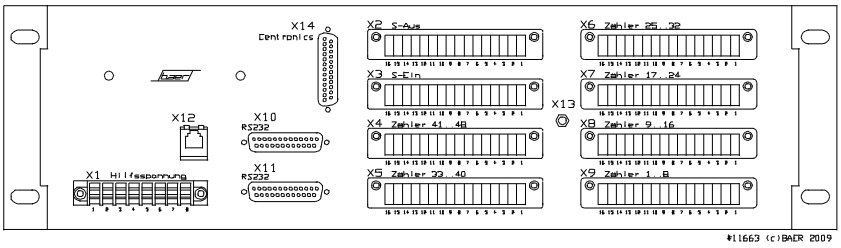
Connector to telephone network (PSTN)

Type RJ12 (Conversion from TAE6N to RJ12)

Purpose: Network connection TAE6N (PSTN)

TAE	Label	RJ12
1	a1/La	5
2	b1/Lb	2
3	G	4
4	E	3
5	b2	1
6	a2	6
Shield	S	

Type 2 / PHOENIX

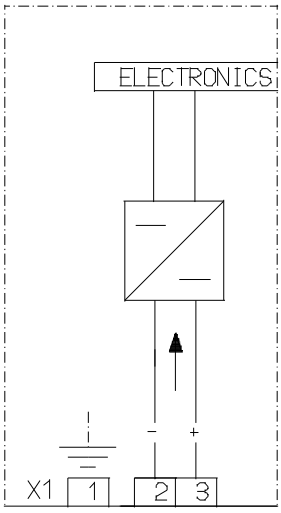


Terminal Connector X1

Type: Socket PHOENIX DFK4/8-G-7,62-LOE
Plug PHOENIX PC 4/8-ST-7,62

Purpose: Power supply unit

Switched mode mains power supply: Alternating Current (AC): 110/230VAC supply voltage
Optional: Direct Current (DC): 60VDC or 110VDC



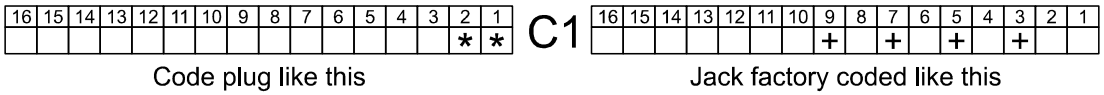
Terminal		Label
1	PE	Protective Earth
2	N	AC: Neutral DC: 0V (minus)
3	L1	AC: Phase 110V/230VAC DC: Input Voltage (plus)
4		
5		
6		
7		
8		

Terminal Connector X2

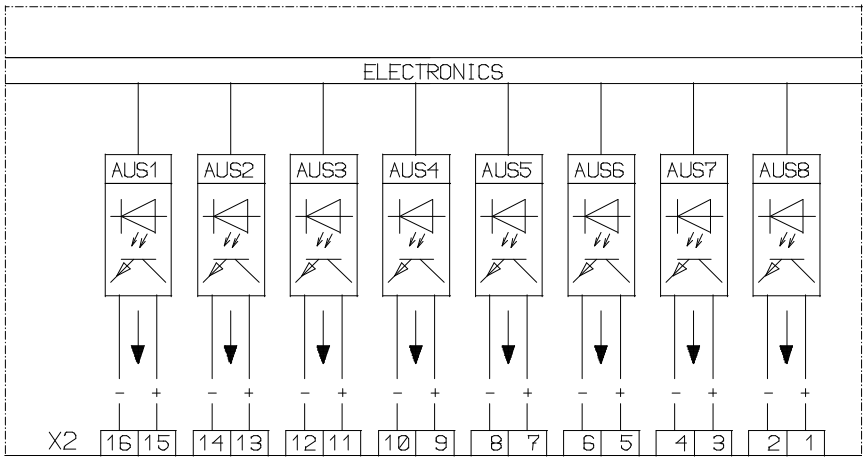
Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

Purpose: Control signal outputs (SSA) only IAW

Terminal	Label	Description
1	AUS8+ (SSA)	Output 8 IAW
2	AUS8- (SSA)	Output 8 IAW
3	AUS7+ (SSA)	Output 7 IAW
4	AUS7- (SSA)	Output 7 IAW
5	AUS6+ (SSA)	Output 6 IAW
6	AUS6- (SSA)	Output 6 IAW
7	AUS5+ (SSA)	Output 5 IAW
8	AUS5- (SSA)	Output 5 IAW
9	AUS4+ (SSA)	Output 4 IAW
10	AUS4- (SSA)	Output 4 IAW
11	AUS3+ (SSA)	Output 3 IAW
12	AUS3- (SSA)	Output 3 IAW
13	AUS2+ (SSA)	Output 2 IAW
14	AUS2- (SSA)	Output 2 IAW
15	AUS1+ (SSA)	Output 1 IAW
16	AUS1- (SSA)	Output 1 IAW



Code plug like this — Jack factory coded like this



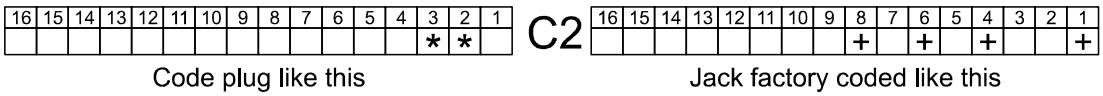
This document is valid only for devices without special terminal assignment diagram delivered.

Terminal Connector X3

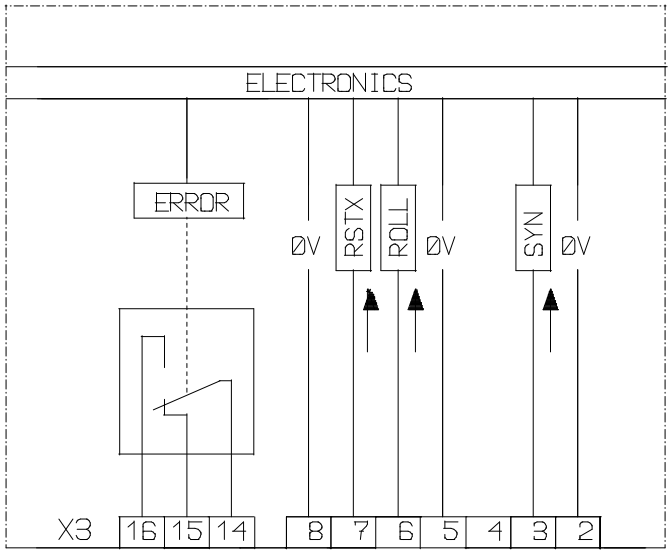
Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

Purpose: Control signal inputs (SSE) only possible for IES
Alarm relay (SSA)

Terrminal	Designation		Description
1			
2	0V		Common ground of the control inputs
3	SYN		Synchronization input
4			
5	0V		Common ground of the control inputs
6	ROLL (ANZ)		Roll (ANZ) contact for display
7	RSTX		External reset signal
8	0V		Common ground of the control inputs
9			
10			
11			
12			
13			
Alarm relay			
14	SA (com)	(SSA)	Signal output COMMON
15	SA (no active)	(SSA)	Signal output ERROR (default)
16	SA (active)	(SSA)	Signal output NO ERROR



Code plug like this — Jack factory coded like this



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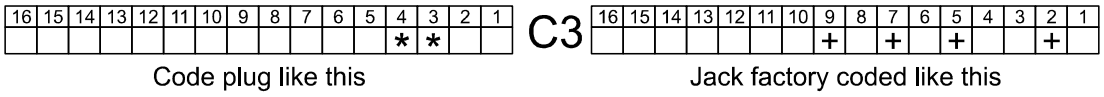
Terminal Connector X9

Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

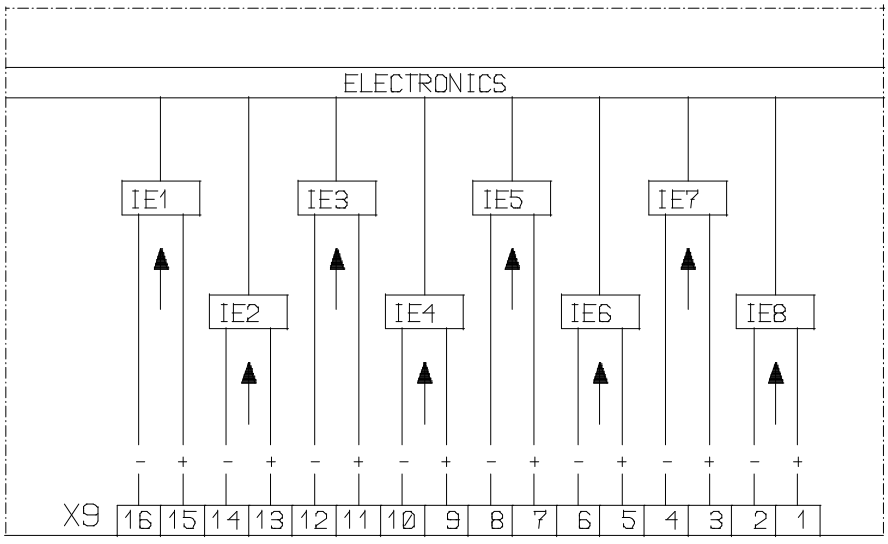
Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE8+	(IE)	Pulse input 8
2	IE8-	(IE)	Pulse input 8
3	IE7+	(IE)	Pulse input 7
4	IE7-	(IE)	Pulse input 7
5	IE6+	(IE)	Pulse input 6
6	IE6-	(IE)	Pulse input 6
7	IE5+	(IE)	Pulse input 5
8	IE5-	(IE)	Pulse input 5
9	IE4+	(IE)	Pulse input 4
10	IE4-	(IE)	Pulse input 4
11	IE3+	(IE)	Pulse input 3
12	IE3-	(IE)	Pulse input 3
13	IE2+	(IE)	Pulse input 2
14	IE2-	(IE)	Pulse input 2
15	IE1+	(IE)	Pulse input 1
16	IE1-	(IE)	Pulse input 1



Code plug like this

Jack factory coded like this

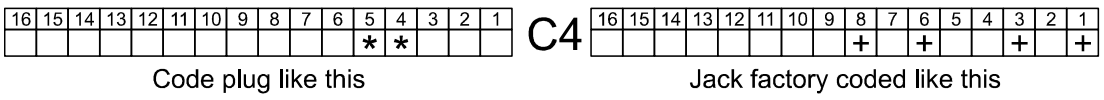


Terminal Connector X8

Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

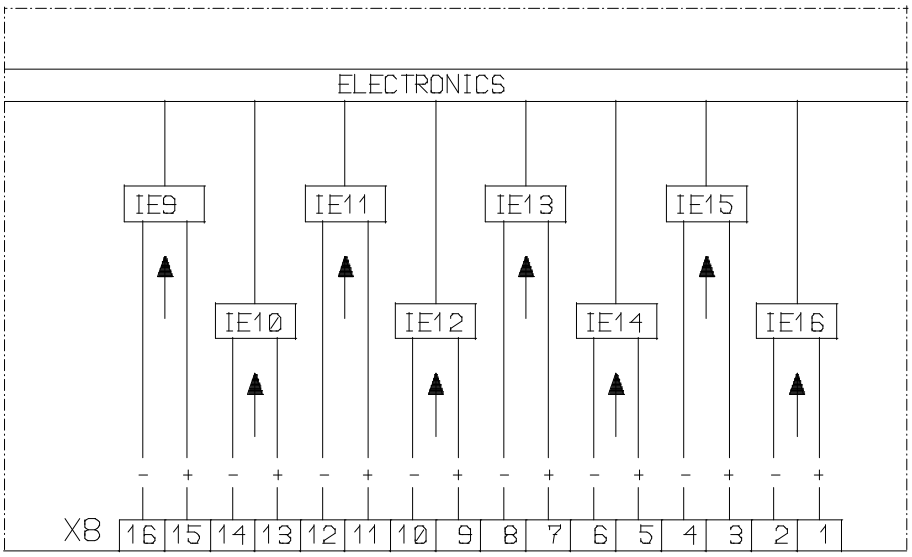
Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE16+	(IE)	Pulse input 16
2	IE16-	(IE)	Pulse input 16
3	IE15+	(IE)	Pulse input 15
4	IE15-	(IE)	Pulse input 15
5	IE14+	(IE)	Pulse input 14
6	IE14-	(IE)	Pulse input 14
7	IE13+	(IE)	Pulse input 13
8	IE13-	(IE)	Pulse input 13
9	IE12+	(IE)	Pulse input 12
10	IE12-	(IE)	Pulse input 12
11	IE11+	(IE)	Pulse input 11
12	IE11-	(IE)	Pulse input 11
13	IE10+	(IE)	Pulse input 10
14	IE10-	(IE)	Pulse input 10
15	IE 9+	(IE)	Pulse input 9
16	IE 9-	(IE)	Pulse input 9



Code plug like this

Jack factory coded like this

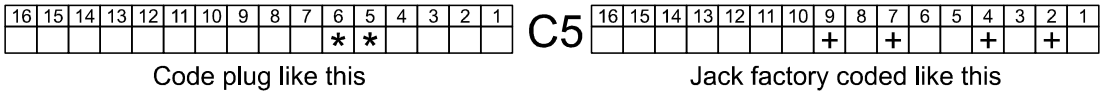


Terminal Connector X7

Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE24+	(IE)	Pulse input 24
2	IE24-	(IE)	Pulse input 24
3	IE23+	(IE)	Pulse input 23
4	IE23-	(IE)	Pulse input 23
5	IE22+	(IE)	Pulse input 22
6	IE22-	(IE)	Pulse input 22
7	IE21+	(IE)	Pulse input 21
8	IE21-	(IE)	Pulse input 21
9	IE20+	(IE)	Pulse input 20
10	IE20-	(IE)	Pulse input 20
11	IE19+	(IE)	Pulse input 19
12	IE19-	(IE)	Pulse input 19
13	IE18+	(IE)	Pulse input 18
14	IE18-	(IE)	Pulse input 18
15	IE 17+	(IE)	Pulse input 17
16	IE 17-	(IE)	Pulse input 17



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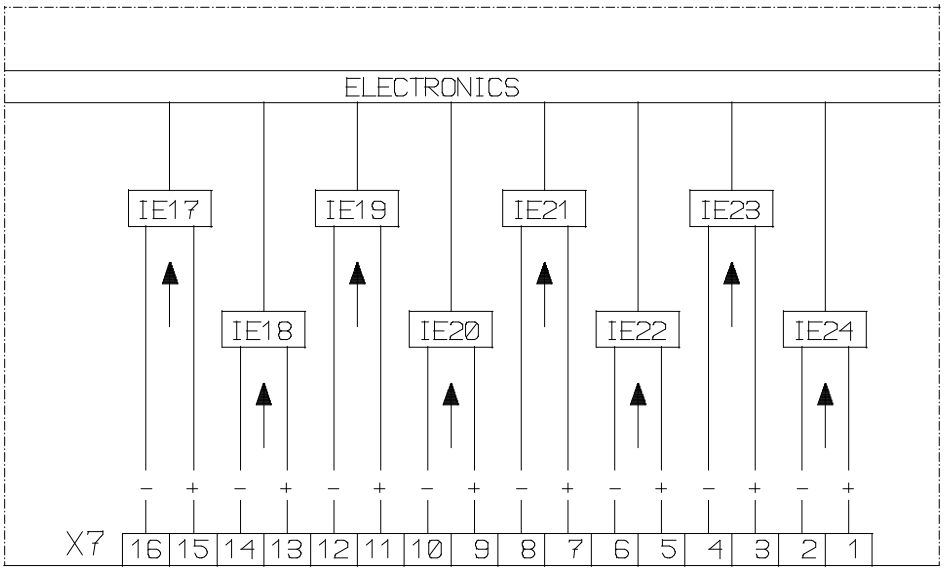
Jack factory coded like this

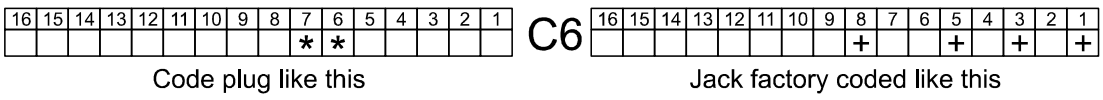


Terminal Connector X6

Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE32+	(IE)	Pulse input 32
2	IE32-	(IE)	Pulse input 32
3	IE31+	(IE)	Pulse input 31
4	IE31-	(IE)	Pulse input 31
5	IE30+	(IE)	Pulse input 30
6	IE30-	(IE)	Pulse input 30
7	IE29+	(IE)	Pulse input 29
8	IE29-	(IE)	Pulse input 29
9	IE28+	(IE)	Pulse input 28
10	IE28-	(IE)	Pulse input 28
11	IE27+	(IE)	Pulse input 27
12	IE27-	(IE)	Pulse input 27
13	IE26+	(IE)	Pulse input 26
14	IE26-	(IE)	Pulse input 26
15	IE25+	(IE)	Pulse input 25
16	IE25-	(IE)	Pulse input 25



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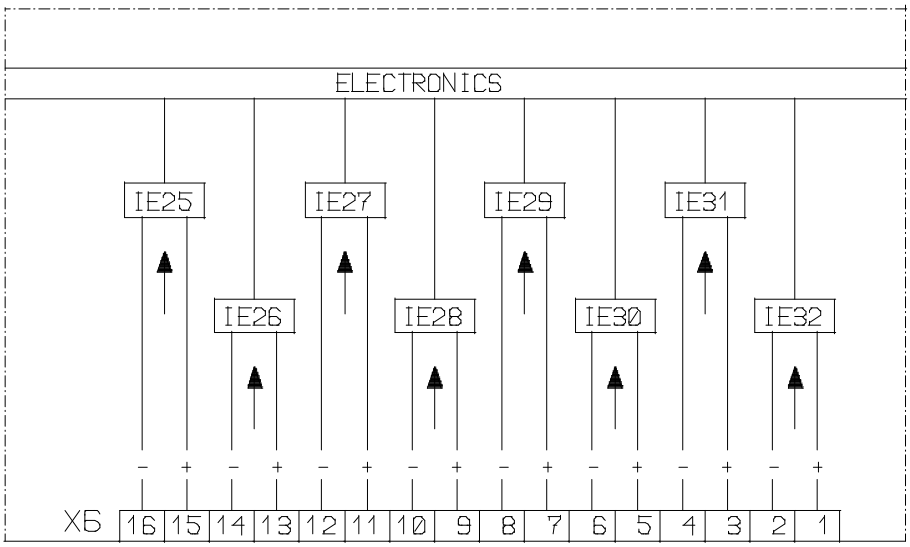
Jack factory coded like this



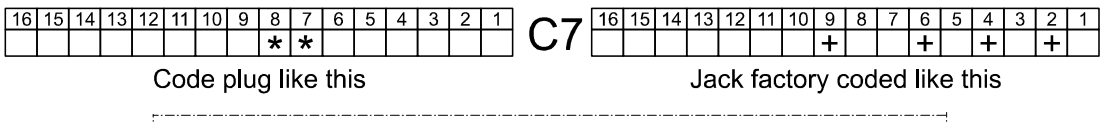
This document is valid only for devices without special terminal assignment diagram delivered.

Terminal Connector X5

Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

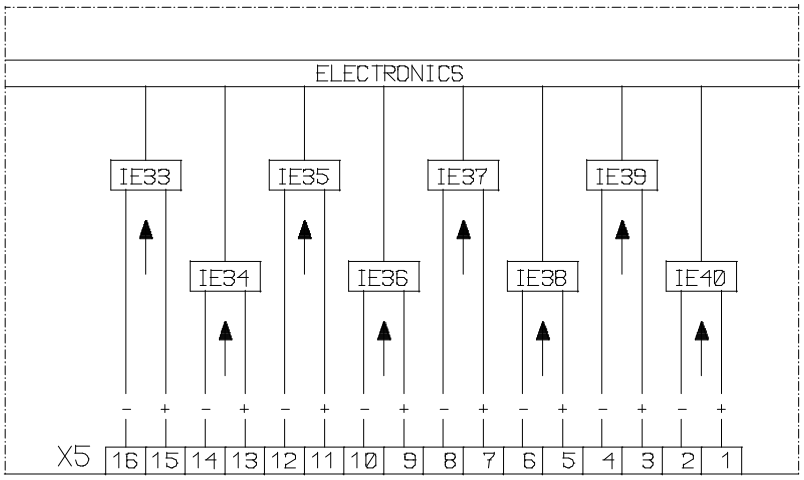
Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE40+	(IE)	Pulse input 40
2	IE40-	(IE)	Pulse input 40
3	IE39+	(IE)	Pulse input 39
4	IE39-	(IE)	Pulse input 39
5	IE38+	(IE)	Pulse input 38
6	IE38-	(IE)	Pulse input 38
7	IE37+	(IE)	Pulse input 37
8	IE37-	(IE)	Pulse input 37
9	IE36+	(IE)	Pulse input 36
10	IE36-	(IE)	Pulse input 36
11	IE35+	(IE)	Pulse input 35
12	IE35-	(IE)	Pulse input 35
13	IE34+	(IE)	Pulse input 34
14	IE34-	(IE)	Pulse input 34
15	IE33+	(IE)	Pulse input 33
16	IE33-	(IE)	Pulse input 33



Code plug like this

Jack factory coded like this

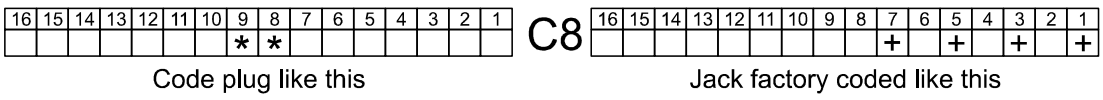


Terminal Connector X4

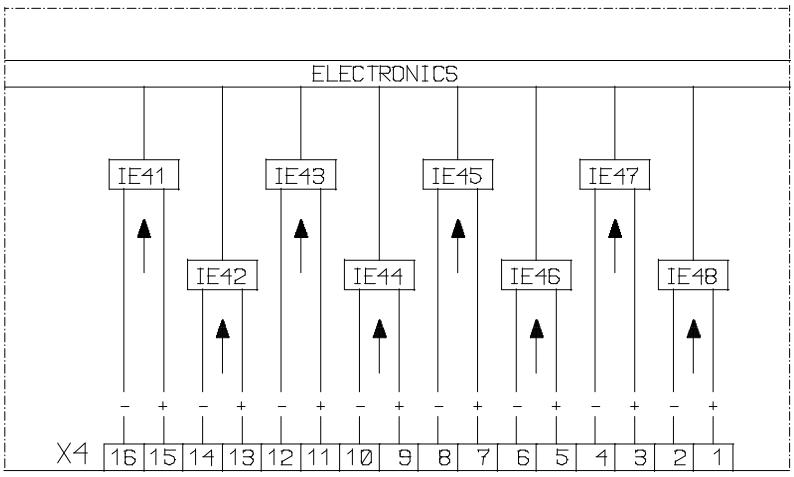
Type: Socket PHOENIX DFK-MSTB 2,5/16-GF
Plug PHOENIX MSTB 2,5/16-ST

Purpose: 8 pulse inputs (IE)

Terminal	Designation		Description
1	IE48+	(IE)	Pulse input 48
2	IE48-	(IE)	Pulse input 48
3	IE47+	(IE)	Pulse input 47
4	IE47-	(IE)	Pulse input 47
5	IE46+	(IE)	Pulse input 46
6	IE46-	(IE)	Pulse input 46
7	IE45+	(IE)	Pulse input 45
8	IE45-	(IE)	Pulse input 45
9	IE44+	(IE)	Pulse input 44
10	IE44-	(IE)	Pulse input 44
11	IE43+	(IE)	Pulse input 43
12	IE43-	(IE)	Pulse input 43
13	IE42+	(IE)	Pulse input 42
14	IE42-	(IE)	Pulse input 42
15	IE41+	(IE)	Pulse input 41
16	IE41-	(IE)	Pulse input 41



Code plug like this — Jack factory coded like this



RS232 / V.24 - Socket X10 (option X11)

Type: 25-pin plug-in connector SUB-D in compliance with ISO 2110
Assignment V.24/RS232C/DIN 66020

Purpose: General RS232 interface, used e.g. for load prediction purposes.

Pin	Label		Description
2	TxD	Input	Transmit data
3	RxD	Output	Receive data
4	RTS	Input	Request to send
5	CTS	Output	Clear to send
7	GND		Signal-Ground

Centronics socket for external printer X14 (option X11)

Type: 25-way plug-in connector SUB-D female to ISO 2110

Purpose: Connection of a centronics compatible printer

Pin	Label	Description
1	Pstb	Data is valid
2	P0	Data line 0
3	P1	Data line 1
4	P2	Data line 2
5	P3	Data line 3
6	P4	Data line 4
7	P5	Data line 5
8	P6	Data line 6
9	P7	Data line 7
11	Pbusy	Printer message: busy
12	Pempty	Printer message: no paper
18	GND	Signal ground
19	GND	Signal ground
20	GND	Signal ground
21	GND	Signal ground
22	GND	Signal ground
23	GND	Signal ground
24	GND	Signal ground
25	GND	Signal ground

Connector to telephone network (PSTN) X12

Type RJ12 (Conversion from TAE6N to RJ12)

Purpose: Network connection TAE6N (PSTN)

TAE	Label	RJ12
1	a1/La	5
2	b1/Lb	2
3	G	4
4	E	3
5	b2	1
6	a2	6
Shield	S	

Connector to radio clock (DCF77 or GPS) X13

Appendix E

GPS170SV
(Option)

MEINBERG

Technical Information

Operating Instructions

GPS170SV

Incl. Windows Software
GPSMON32

Imprint

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July 27, 2007

Table of Contents

General Information

The satellite receiver clock GPS170 has been designed to provide extremly precise time to its user. The clock has been developed for applications where conventional radio controlled clocks can´t meet the growing requirements in precision. High precision available 24 hours a day around the whole world is the main feature of the new system which receives its information from the satellites of the Global Positioning System.

The Global Positioning System (GPS) is a satellite-based radio-positioning, navigation, and time-transfer system. It was installed by the United States Departement of Defense and provides two levels of accuracy: The Standard Positioning Service (SPS) and the Precise Positioning Service (PPS). While PPS is encrypted and only available for authorized (military) users, SPS has been made available to the general public.

GPS is based on accurately measuring the propagation time of signals transmitted from satellites to the user´s receiver. A nominal constellation of 21 satellites together with several active spares in six orbital planes 20000 km over ground provides a minimum of four satellites to be in view 24 hours a day at every point of the globe. Four satellites need to be received simultaneously if both receiver position (x, y, z) and receiver clock offset from GPS system time must be computed. All the satellites are monitored by control stations which determine the exact orbit parameters as well as the clock offset of the satellites´ on-board atomic clocks. These parameters are uploaded to the satellites and become part of a navigation message which is retransmitted by the satellites in order to pass that information to the user´s receiver.

The high precision orbit parameters of a satellite are called ephemeris parameters whereas a reduced precision subset of the ephemeris parameters is called a satellite´s almanac. While ephemeris parameters must be evaluated to compute the receiver´s position and clock offset, almanac parameters are used to check which satellites are in view from a given receiver position at a given time. Each satellite transmits its own set of ephemeris parameters and almanac parameters of all existing satellites.

GPS170SV Features

The GPS170SV hardware is a 100mm x 160mm microprocessor board. The 40.6mm wide front panel integrates two LED indicators and one covered push button. The receiver is connected to the antenna/converter unit by a 50 ohm coaxial cable (refer to "Mounting the Antenna"). Feeding the antenna/converter occurs DC insulated via the antenna cable. Optional an antenna diplexer for up to four receivers connected to one antenna is available.

The GPS170SV is using the "Standard Positioning Service" SPS. Navigation messages coming in from the satellites are decoded by the GPS170SV microprocessor in order to track the GPS system time. Compensation of the RF signal´s propagation delay is done by automatic determination of the receiver´s geographical position. A correction value computed from the satellites´ navigation messages increases the accuracy of the board´s oven controlled master oscillator (OCXO) and automatically compensates the OCXO´s aging. The last state of this value is restored from the battery buffered memory at power-up.

The GPS170SV has several different optional outputs, including three progammable pulses, modulated / unmodulated timecode and max. four RS232 COM ports, depending on the hardware configuation. Additionally, you can get the GPS170SV with different OCXO´s (e.g. OCXO- LQ / MQ / HQ / DHQ or Rubidium) to cover all levels of accuracy requirements.

You can review and change the hard- and software configuration options of the clock with the GPSMON32 application (see corresponding section in this manual).

Time Zone and Daylight Saving Time

GPS system time differs from the universal time scale (UTC) by the number of leap seconds which have been inserted into the UTC time scale after GPS has been initiated in 1980. The current number of leap seconds is part of the navigation message supplied by the satellites, so GPS170SV´s internal real time is based on UTC. Conversion to local time including handling of daylight saving time for each year can be performed by the receiver´s microprocessor if the corresponding parameters are correctly set by using the GPSMON32 application.

Pulse Outputs

The pulse generator of GPS170SV generates pulses once per second (P_SEC) and once per minute (P_MIN). Additionally, master frequencies of 10 MHz, 1 MHz and 100 kHz are derived from the oscillator. All the pulses are available with TTL level at the rear connector.

Frequency Outputs (optional)

The optional synthesizer generates a frequency from 1/8 Hz up to 10 MHz synchronous to the internal timing frame. The phase of this output can be shifted from -360° to +360° for frequencies less than 10 kHz. Both frequency and phase can be configured with the GPSMON32 application via serial port COM0. Synthesizer output is available at the rear connector as sine-wave output (F_SYNTH_SIN), with TTL level (F_SYNTH) and via an open drain output (F_SYNTH_OD). The open drain output can be used to drive an optocoupler when a low frequency is generated.

In the default mode of operation, pulse outputs and the synthesizer output are disabled until the receiver has synchronized after power-up. However, the system can be configured to enable those outputs immediately after power-up. An additional TTL output (TIME_SYN) reflects the state of synchronization. This output switches to TTL HIGH level when synchronization has been achieved and returns to TTL LOW level if no satellite can be received or the receiver is manually forced to another mode of operation by the user.

Time Capture Inputs

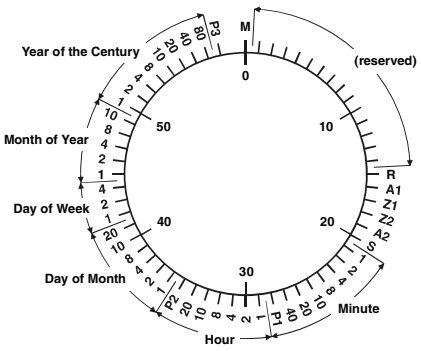
Two time capture inputs called User Capture 0 and 1 are provided at the rear connector (CAP0 and CAP1) to measure asynchronous time events. A falling TTL slope at one of these inputs lets the microprocessor save the current real time in its capture buffer. Capture events are then printed out via COM0 or COM1. The capture buffer has a capacity of more than 500 events, so either a burst of events with intervals down to less than 1.5 msec or a continuous stream of events at a lower rate depending on the transmission speed of COM0 or COM1 can be recorded. The format of the output string is ASCII, see the technical specifications at the end of this document for details. If the capture buffer is full a message "** capture buffer full" is transmitted, if the interval between two capture events is too short the warning "** capture overrun" is being sent.

Asynchronous Serial Ports (optional 4x COM)

Up to four asynchronous serial RS232 interfaces (COM0 ... COM3) are available to the user. In the default mode of operation, the serial outputs are disabled until the receiver has synchronized after power-up. However, the system can be configured to enable those outputs immediately after power-up. Transmission speeds, framings and mode of operation can be configured separately using GPSMON32. COM0 is compatible with other radio remote clocks made by Meinberg. It sends the time string either once per second, once per minute or on request (after receiving a ′?′ character). Additionally the interfaces can be configured to transmit capture data either automatically when available or on request. The format of the output strings is ASCII, see the technical specifications at the end of this document for details. The corresponding parameters can be set up by GPSMON32 via the serial port COM0.

DCF77 Emulation

The GPS170 satellite controlled clock generates TTL level time marks (active HIGH) which are compatible with the time marks distributed by the German long wave radio transmitter DCF77. This time broadcast station installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany: time of day, date of month and day of week in BCD coded second pulses. The complete time information is transmitted once every minute. Please note that the GPS170SV generates time marks representing its local time as configured by the user, including announcement of changes in daylight saving and announcement of leap seconds. The coding scheme is given below:



M	Start of Minute (0.1 s)
R	RF Transmission via secondary antenna
A1	Announcement of a change in daylight saving
Z1, Z2	Time zone identification
	Z1, Z2 = 0, 1: Daylight saving disabled
	Z1, Z2 = 1, 0: Daylight saving enabled
A2	Announcement of a leap second
S	Start of time code information
P1, P2, P3	Even parity bits

Time marks start at the beginning of a new second. If a binary "0" is to be transmitted, the length of the corresponding time mark is 100 msec, if a binary "1" is transmitted, the time mark has a length of 200 msec. The information on the current date and time as well as some parity and status bits can be decoded from the time marks of the 15th up to the 58th second every minute. The absence of any time mark at the 59th second of a minute signals that a new minute will begin with the next time mark. The DCF emulation output is enabled immediately after power-up.

Programmable Pulses (optional)

At the male connector Typ VG64 there are three programmable TTL outputs (Prog Pulse 0-2), which are arbitrarily programmable using the GPSMON32 software.

Other technical details are described at the end of this manual.

Time code outputs (optional)

Abstract

The transmission of coded timing signals began to take on widespread importance in the early 1950´s. Especially the US missile and space programs were the forces behind the development of these time codes, which were used for the correlation of data. The definition of time code formats was completely arbitrary and left to the individual ideas of each design engineer. Hundreds of different time codes were formed, some of which were standardized by the "Inter Range Instrumentation Group" (IRIG) in the early 60´s.

Except these "IRIG Time Codes", other formats like NASA36, XR3 or 2137 are still in use. The board GPS170 however generates the IRIG-B, AFNOR NFS 87-500 code as well as IEEE1344 code which is an IRIG-B123 coded extended by information for time zone, leap second and date. Other formats may be available on request.

A modulated IRIG-B (3Vpp into 50Ω) and an unmodulated DC level shift IRIG-B (TTL) signal are available at the VG64 male connector of the module.

Installation

Power Supply

The power supply used with a GPS170 has to provide only one output of +5V. The output voltage should be well regulated because drifting supply voltages reduce the short time accuracy of the generated frequencies and timing pulses. The power supply lines should have low resistance and must be connected using both pins a and c of the rear connector.

Mounting the Antenna

The GPS satellites are not geostationary, each of them circles around the earth approx. every 12 hours. The satelite signals can be received only if no building or any other object is in the line-of-sight from the antenna to the satellite, therefore the antenna/converter unit must be installed in a location with an unobstructed view of the sky. Very good reception is possible when the antenna has a free view of 8° angular elevation above horizon. If this is not possible the antenna should be installed with a free view to the equator because of the satellite courses which are located between latitudes of 55° North and 55° South. If even this is not possible, problems will occur, especially during position aquisition, when at least four satellites for calculation of the receivers position have to be available. As soon as the position has been determined, one satellite is enough to remain in synchronized state.

The antenna/converter unit can be mounted on a pole with a diameter up to 60 mm or at a wall. Every GPS170 comes with a 50cm plastic tube, two holders for wall-mounting and clamps for pole-mounting. A standard coaxial cable with 50 ohms impedance should be used to connect the antenna/converter unit to the receiver. The maximum lenght of cable between antenna and receiver depends on the attenuation factor of the used coaxial cable.

Example:

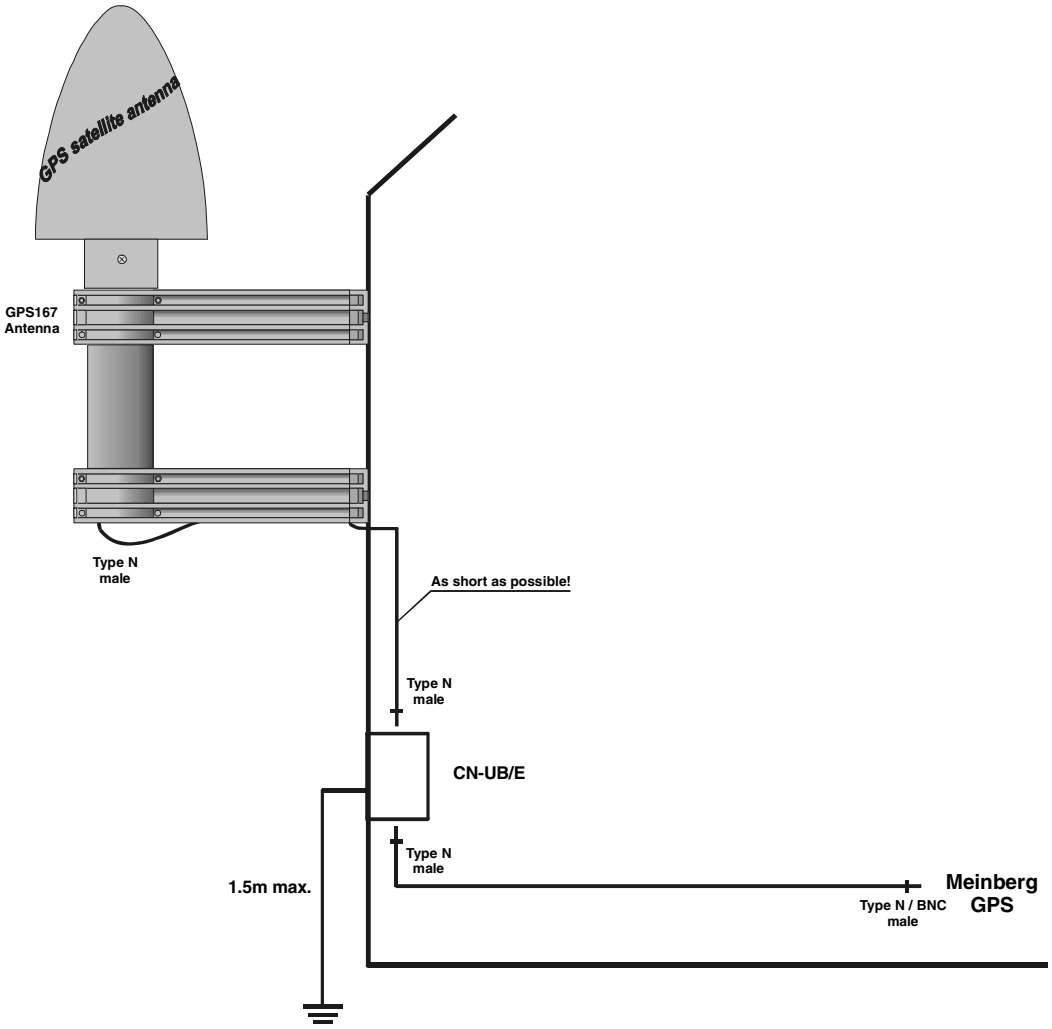
Type of cable	diameter Ø [mm]	Attenuation at 100MHz [dB]/100m	max. lenght [m]
RG58/CU	5mm	15.9	300 [1]
RG213	10.5mm	6.9	700 [1]
1)This specifications are made for antenna/converter units produced after January, 2005			
The values are typically ones; the exact ones are to find out from the data sheet of the used cable.			

Up to four GPS170 receivers can be run with one antenna/converter unit by using the optional antenna diplexer. The total length of one antenna line between antenna, diplexer and receiver must not be longer than the max. lenght shown in the table above. The position of the diplexer in the antenna line does not matter.

When installing the high voltage protector CN-UB/E (CN-UB-280DC) be aware to set it directly after reaching indoor. The CN-UB/E is not for outdoor usage.

Assembly with CN-UB/E (optional)

Optionally the overvoltage protector CN-UB/E is available. Normally you directly connect the antenna converter to the system with the antenna cable.



Powering Up the System

If both the antenna and the power supply have been connected, the system is ready to operate. Between 10 seconds (with OCXO-LQ) and 3 minutes (with OCXO-MQ / HQ option) after power-up the receiver's oscillator has warmed up and operates with the specified accuracy. If the receiver finds valid almanac and ephemeris data in its battery buffered memory and the receiver´s position has not changed significantly since its last operation, the receiver can find out which satellites are in view now. Only a single satellite needs to be received to synchronize and generate output pulses, therfore synchronization state can be reached within one minute (OCXO-LQ) or within 10 minutes (OCXO-MQ / HQ) after start. After 20 minutes of operation the OCXO is fully adjusted and the generated frequencies are within the specified limits.

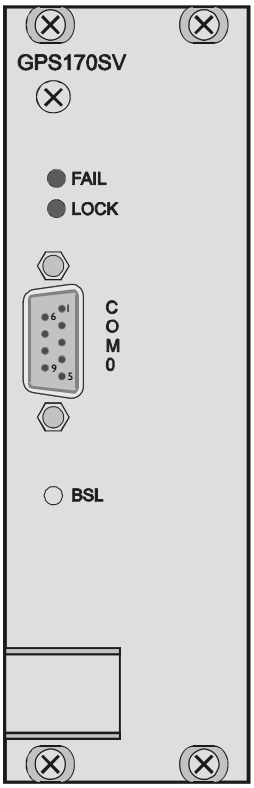
If the receiver position has changed by some hundred kilometers since last operation, the satellites´ real elevation and doppler might not match the values expected by the receiver thus forcing it to start scanning for satellites. This mode is called **Warm Boot**, and the receiver can obtain ID numbers of existing satellites from the valid almanac. When the receiver has found four satellites in view it can recalculate its position and afterwards will switch to **Normal Operation**. If the almanac has been lost due to a disconnected battery, the receiver will scan for a satellite and read in the current almanacs (every satellite periodically transmits them). This mode is called **Cold Boot**. It takes up to 12 minutes until the new almanac has been received completely and upon completition the system will switch to **Warm Boot** mode, scanning for other available satellites.

In the standard mode of operation, neither pulse and synthesizer outputs nor the serial ports will be enabled after power-up until full GPS synchronization has been achieved. However, it is possible to configure some or all of those outputs to be enabled immediately after power-up. If the system starts up in a new environment (e. g. receiver position has changed or new power supply) it can take a couple of minutes until the OCXO´s output frequency has been adjusted. Until this point the frequency accuracy drops to 10^{-8} reducing the accuracy of pulses to ±5µs.

The Front Panel Layout

FAIL LED

The FAIL LED is turned on whenever the TIME_SYN output is low (receiver is not synchronized).



LOCK LED

The LOCK LED is turned on when after power-up the receiver has acquired at least four satellites and has computed its position. In normal operation the receiver position is updated continuously as long as at least four satellites can be received. When the receivers position is known and steady only a single satellite needs to be received to synchronize and generate output pulses.

BSL Button

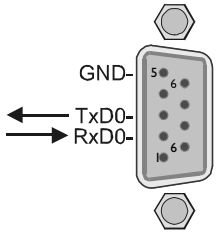
Whenever the on-board software must be upgraded or modified, the new firmware can be downloaded to the internal flash memory via the serial port COM0. There is no need to open the metal case and insert a new EPROM.

If the BSL pushbutton behind the front panel is pressed while the system is powered up, a bootstrap-loader is actived and waits for instructions from the serial port COM0. The new firmware can be sent to GPS170SV from any standard PC with serial interface. A loader program will be shipped together with the file containing the image of the new firmware.

The contents of the program memory will not be modified until the loader program has sent the command to erase the flash memory. So if the BSL pushbutton is pressed unintentionally while the system is powered up, the firmware will not be changed accidentially. After the next power-up, the system will be ready to operate again.

RS232 COM0

The serial port COM0 is accessible via a 9pin DSUB male connector (older version 9pol. DSUB male connector) in the frontpanel of the GPS170SV, parallel hardwired to the COM0 port on the rear VG edge connector.



RS232
COM0

Skilled/Service-Personnel only: Replacing the Lithium Battery

The lifespan of the lithium battery on the board is at least 10 years. If it is required to replace the battery, the following should be noted:

ATTENTION!

Danger of explosion in case of inadequate replacement of the lithium battery. Only identical batteries or batteries recommended by the manufacturer must be used for replacement. The waste battery must be disposed as proposed by the manufacturer of the battery.

CE Label

CE

This device conforms to the directive 89/336/EWG on the approximation of the laws of the Member States of the European Community relating to electromagnetc compatibility.

Technical Specifications GPS170SV

RECEIVER:	6 channel C/A code receiver with external antenna/converter unit
ANTENNA:	Antenna/converter unit with remote power supply refer to chapter "Technical Specifications GPS170 Antenna"
ANTENNA INPUT:	antenna circuit dc-insulated; dielectric strength: 1000V⎓ Length of cable: refer to chapter "Mounting the Antenna"
TIME TO SYNCHRONIZATION:	one minute with known receiver position and valid almanac 12 minutes if invalid battery buffered memory
PULSE OUTPUTS:	change of second (P_SEC, TTL level) change of minute (P_MIN, TTL level)
ACCURACY OF PULSES:	after synchronization and 20 minutes of operation TCXO HQ/OCXO LQ : better than ±250 nsec OCXO MQ/OCXO HQ : better than ±100 nsec OCXO DHQ/Rubidium : better than ±100 nsec better than ±2 µsec during the first 20 minutes of operation
FREQUENCY OUTPUTS:	10 MHz, TTL level into 50Ω 1 MHz, TTL level 100 kHz, TTL level
ACCURACY OF FREQUENCY:	see Oscillator specification

FREQUENZ-SYNTHESIZER: 1/8 Hz up to 10 MHz

ACCURACY OF SYNTHESIZER: base accuracy depends on system accuracy

1/8 Hz to 10 kHz	Phase syncron with pulse output P_SEC
10 kHz to 10 MHz	frequency deviation < 0.0047 Hz

SYNTHESIZER OUTPUTS:

F_SYNTH:	TTL level	
F_SYNTH_OD:	open drain	
	drain voltage:	< 100 V
	sink current to GND:	< 100 mA
	dissipation power at 25°C:	< 360 mW
F_SYNTH_SIN	sine-wave	
	output voltage:	1.5 V eff.
	output impedance:	200 Ohm

TIME_SYN OUTPUT: TTL HIGH level if synchronized

SERIAL PORTS: max. 4 asynchronous serial ports (RS-232)

Baud Rate: 300 up to 19200
Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1

default setting:

COM0:	19200, 8N1
COM1:	9600, 8N1
COM2:	9600, 7E2
COM3:	9600, 7E2

Annotation: Even if one of the setup functions "INIT USER PARMS" or "Resetting Factory Defaults" is executed, the serial port parameters are reset to default values only if invalid parameters have been configured.

TIME CAPTURE INPUTS: triggered on falling TTL slope
Interval of events: 1.5msec min.
Resolution: 100ns

POWER REQUIREMENTS:	5V ± 5%, max. @1100mA (see oscilatorspecifikations)
PHYSICAL DIMENSIONS:	Eurocard, 100mm x 160mm, 1.5mm Epoxy
FRONT PANEL:	3U / 8HP (128mm high x 40.5mm wide), Aluminium
REAR EDGE CONNECTOR:	according to DIN 41612, type C 64, rows a+c (male)
RF CONNECTOR:	coaxial SMB connector (male)
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY:	85% max.

Specifications of Internal Oscillator

Accuracy of time and frequency outputs of Meinberg GPS- and DCF77 (PZF) receivers with different oscillator options

	TCXO	OCXO LQ	OCXO MQ	OCXO HQ	OCXO DHQ	Rubidium
short term stability (τ = 1 sec)	$2 * 10^{-9}$	$1 * 10^{-9}$	$2 * 10^{-10}$	$5 * 10^{-12}$	$2 * 10^{-12}$	$2 * 10^{-11}$
accuracy of PPS (pulse per second)	< +/- 250 nsec < +/- 500 nsec (GPS163)	< +/- 250 nsec	< +/- 100 nsec	< +/- 100 nsec	< +/- 100 nsec	< +/- 100 nsec
phase noise	1 Hz -60 dBc/Hz 10 Hz -90 dBc/Hz 100 Hz -120 dBc/Hz 1 kHz -130 dBc/Hz	1 Hz -60 dBc/Hz 10 Hz -90 dBc/Hz 100 Hz -120 dBc/Hz 1 kHz -130 dBc/Hz	1 Hz -75 dBc/Hz 10 Hz -110 dBc/Hz 100 Hz -130 dBc/Hz 1 kHz -140 dBc/Hz	1 Hz -100 dBc/Hz 10 Hz -130 dBc/Hz 100 Hz -145 dBc/Hz 1 kHz -155 dBc/Hz	1 Hz -100 dBc/Hz 10 Hz -125 dBc/Hz 100 Hz -140 dBc/Hz 1 kHz -150 dBc/Hz	1 Hz -75 dBc/Hz 10 Hz -89 dBc/Hz 100 Hz -128 dBc/Hz 1 kHz -140 dBc/Hz
accuracy free run, one day	+/- $1 * 10^{-7}$ +/- 1 Hz (Note 1)	+/- $2 * 10^{-8}$ +/- 0,2 Hz (Note 1)	+/- $1,5 * 10^{-9}$ +/- 15 mHz (Note 1)	+/- $5 * 10^{-10}$ +/- 5 mHz (Note 1)	+/- $1 * 10^{-10}$ +/- 1 mHz (Note 1)	+/- $2 * 10^{-11}$ +/- 0,2 mHz (Note 1)
accuracy free run, one year	+/- $1 * 10^{-6}$ +/- 10 Hz (Note 1)	+/- $4 * 10^{-7}$ +/- 4 Hz (Note 1)	+/- $1 * 10^{-7}$ +/- 1 Hz (Note 1)	+/- $5 * 10^{-8}$ +/- 0,5 Hz (Note 1)	+/- $1 * 10^{-8}$ +/- 0,1 Hz (Note 1)	+/- $5 * 10^{-10}$ +/- 5 mHz (Note 1)
accuracy GPS-synchronous averaged 24 h	+/- $1 * 10^{-11}$	+/- $1 * 10^{-11}$	+/- $5 * 10^{-12}$	+/- $1 * 10^{-12}$	+/- $1 * 10^{-12}$	+/- $1 * 10^{-12}$
accuracy of time free run, one day	+/- 8,6 msec	+/- 1,8 msec	+/- 130µsec	+/- 44 µsec	+/- 10 µsec	+/- 1,8 µsec
accuracy of time free run, one year	+/- 32 sec	+/- 13 sec	+/- 3,5 sec	+/- 1,6 sec	+/- 300 msec	+/- 16 msec
temperature dependant drift, free run	+/- $1 * 10^{-6}$ (-20...70°C)	+/- $2 * 10^{-7}$ (0...60°C)	+/- $5 * 10^{-8}$ (-20...70°C)	+/- $1 * 10^{-8}$ (5...70°C)	+/- $2 * 10^{-10}$ (5...70°C)	+/- $6 * 10^{-10}$ (-25...70°C)
power supply @25°C steady state warm up	5V / 20mA N/A	5V / 160mA 5V / 380mA	5V / 300mA 5V / 700mA	5V / 300mA 5V / 700mA	12V / 250mA 12V / 700mA	24V / 540mA N/A
suitable for clock type	GPS161 GPS163 GPS164 GPS167 (SV) GPS170 (SV) GPS16xPCI GPS16xPC	GPS161 GPS167 (SV) GPS170 (SV) GPS16xPCI (5V only) GPS16xPC (5V only)	GPS161 GPS167 (SV) GPS170 (SV)	GPS161 GPS167 (SV) GPS170 (SV)	GPS167 (SV) GPS170 (SV)	GPS167 (SV) GPS170 (SV)

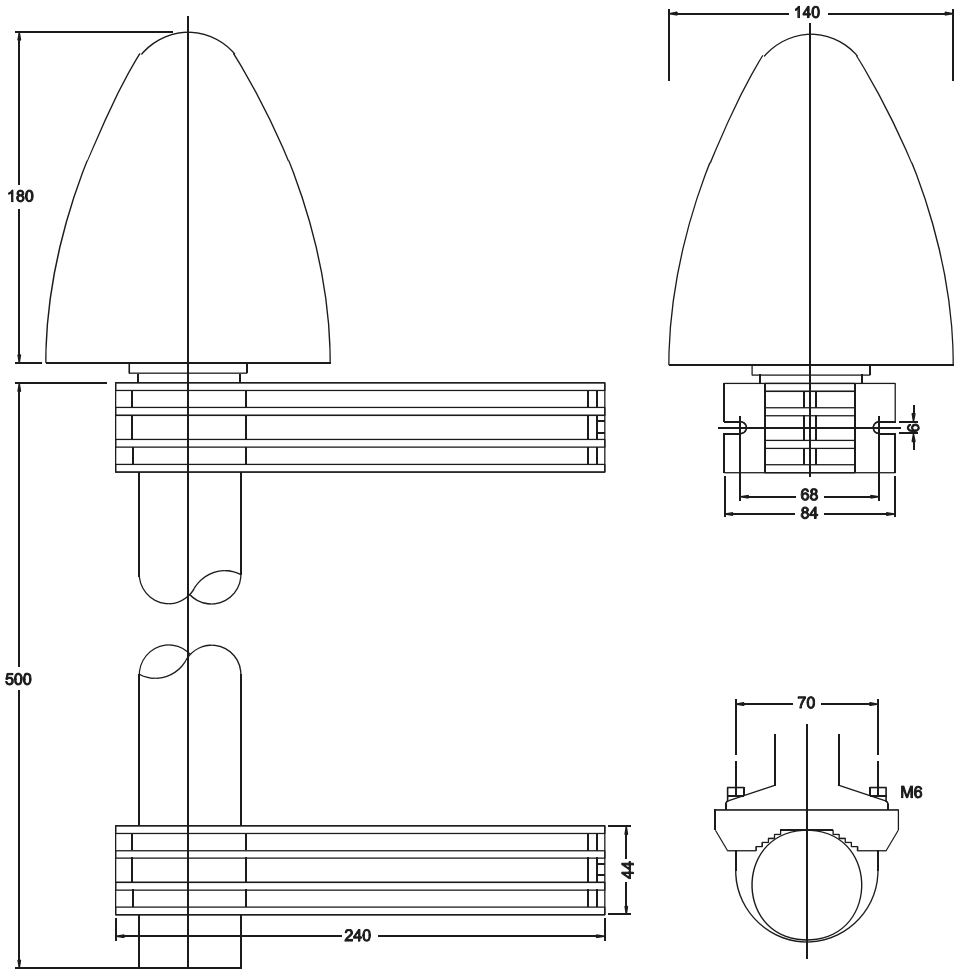
Note 1:
The accuracy in Hertz is based on the standard frequency of 10 MHz. For example: Accuracy of TCXO (free run one day) is +/- 1 * 10 E-7 * 10 MHz = +/- 1 Hz

The given values for the accuracy of frequency and time (not short term accuracy) are only valid for a constant ambient temperature !
A minimum time of 24 hours of GPS-synchronicity is required before free run starts.

Technical Specifications GPS Antenna

ANTENNA:	dielectrical patch antenna, 25 x 25mm	
	receive frequency:	1575.42 MHz
	bandwidth:	9 MHz
CONVERTER:	local oscillator to converter frequency:	10 MHz
	first IF frequency:	35.4 MHz
POWER REQUIREMENTS:	12V ... 18V, @ 100mA (provided via antenna cable)	
CONNECTOR:	coax type N, female	
AMBIENT TEMPERATURE:	-40 ... +65°C	
HOUSING:	ABS plastic case for outdoor installation (IP56)	

PHYSICAL DIMENSION:



Time Strings

Format of the Meinberg Standard Time String

The Meinberg Standard Time String is a sequence of 32 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>D:*dd.mm.yy*;T:*w*;U:*hh.mm.ss*;*uvxy*<ETX>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<STX> Start-Of-Text, ASCII Code 02h
sending with one bit occuracy at change of second

dd.mm.yy the current date:

dd	day of month	(01..31)
mm	month	(01..12)
yy	year of the century	(00..99)

w the day of the week (1..7, 1 = Monday)

hh.mm.ss the current time:

hh	hours	(00..23)
mm	minutes	(00..59)
ss	seconds	(00..59, or 60 while leap second)

uv clock status characters (depending on clock type):

u: '#' GPS: clock is running free (without exact synchr.)
PZF: time frame not synchronized
DCF77: clock has not synchronized after reset

' ' (space, 20h)
GPS: clock is synchronous (base accuracy is reached)
PZF: time frame is synchronized
DCF77: clock has synchronized after reset

v: '*' GPS: receiver has not checked its position
PZF/DCF77: clock currently runs on XTAL

' ' (space, 20h)
GPS: receiver has determined its position
PZF/DCF77: clock is syncronized with transmitter

x time zone indicator:

'U'	UTC	Universal Time Coordinated, formerly GMT
' '	MEZ	European Standard Time, daylight saving disabled
'S'	MESZ	European Summertime, daylight saving enabled

y anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:

'!' announcement of start or end of daylight saving time
'A' announcement of leap second insertion
' ' (space, 20h) nothing announced

<ETX> End-Of-Text, ASCII Code 03h

Format of the Meinberg Capture String

The Meinberg Capture String is a sequence of 31 ASCII characters terminated by a CR/LF (Carriage Return/Line Feed) combination. The format is:

CH*x_tt.mm.jj_hh:mm:ss.fffffff*<CR><LF>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

x	0 or 1 corresponding on the number of the capture input		
_	ASCII space 20h		
dd.mm.yy	the capture date:		
	dd	day of month	(01..31)
	mm	month	(01..12)
	yy	year of the century	(00..99)
hh:mm:ss.fffffff	the capture time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	fffffff	fractions of second, 7 digits	
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

Format of the SAT Time String

The SAT Time String is a sequence of 29 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>*dd.mm.yy*/*w*/*hh:mm:ss*xxxx*u*v<ETX>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<STX> Start-Of-Text, ASCII Code 02h
sending with one bit occuracy at change of second

dd.mm.yy the current date:

dd	day of month	(01..31)
mm	month	(01..12)
yy	year of the century	(00..99)

w the day of the week (1..7, 1 = Monday)

hh:mm:ss the current time:

hh	hours	(00..23)
mm	minutes	(00..59)
ss	seconds	(00..59, or 60 while leap second)

xxxx time zone indicator:
'UTC' Universal Time Coordinated, formerly GMT
'MEZ' European Standard Time, daylight saving disabled
'MESZ' European Summertime, daylight saving enabled

u clock status characters:
'#' clock has not synchronized after reset
' ' (space, 20h) clock has synchronized after reset

v anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
'!' announcement of start or end of daylight saving time
' ' (space, 20h) nothing announced

<CR> Carriage Return, ASCII Code 0Dh

<LF> Line Feed, ASCII Code 0Ah

<ETX> End-Of-Text, ASCII Code 03h

Format of the Uni Erlangen String (NTP)

The time string Uni Erlangen (NTP) of a **GPS clock** is a sequence of 66 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>tt.mm.jj; w; hh:mm:ss; voo:oo; acdfg i;bbb.bbbbn lll.llle hhhh*m*<ETX>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<STX> Start-Of-Text, ASCII Code 02h
sending with one bit occuracy at change of second

dd.mm.yy the current date:

dd	day of month	(01..31)
mm	month	(01..12)
yy	year of the century	(00..99)

w the day of the week (1..7, 1 = Monday)

hh.mm.ss the current time:

hh	hours	(00..23)
mm	minutes	(00..59)
ss	seconds	(00..59, or 60 while leap second)

v sign of the offset of local timezone related to UTC

oo:oo offset of local timezone related to UTC in hours and minutes

ac clock status characters:

a: '#' clock has not synchronized after reset
' ' (space, 20h) clock has synchronized after reset

c: '*' GPS receiver has not checked its position
' ' (space, 20h) GPS receiver has determined its position

d time zone indicator:

'S'	MESZ	European Summertime, daylight saving enabled
' '	MEZ	European Standard Time, daylight saving disabled

f anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:

'!' announcement of start or end of daylight saving time
' ' (space, 20h) nothing announced

g anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:

'A' announcement of leap second insertion
' ' (space, 20h) nothing announced

i	leap second insertion ‘L’ leap second is actually inserted (active only in 60th sec.) ‘ ‘ (space, 20h) no leap second is inserted
bbb.bbbb	latitude of receiver position in degrees leading signs are replaced by a space character (20h)
n	latitude, the following characters are possible: ‘N’ north of equator ‘S’ south d. equator
lll.llll	longitude of receiver position in degrees leading signs are replaced by a space character (20h)
e	longitude, the following characters are possible: ‘E’ east of Greenwich ‘W’ west of Greenwich
hhhh	altitude above sea level in meters leading signs are replaced by a space character (20h)
<ETX>	End-Of-Text, ASCII Code 03h

Format of the NMEA 0183 String (RMC)

The NMEA String is a sequence of 65 ASCII characters starting with the '$' character and ending with the characters CR (carriage return) and LF (line-feed). The format is:

$GPRMC,*hhmmss.ss*,*A*,*bbbb.bb*,*n*,*lllll.ll*,*e*,0.0,0.0,*ddmmyy*,0.0,*ahh<*CR*><*LF*>**

The letters printed in *italics* are replaced by ASCII numbers or letters whereas the other characters are part of the time string. The groups of characters as defined below:

$	Start character, ASCII Code 24h sending with one bit occuracy at change of second		
hhmmss.ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	ss	fractions of seconds	(1/10 ; 1/100)
A	Status (A = time data valid) (V = time data not valid)		
bbbb.bb	latitude of receiver position in degrees leading signs are replaced by a space character (20h)		
n	latitude, the following characters are possible: 'N' north of equator 'S' south d. equator		
lllll.ll	longitude of receiver position in degrees leading signs are replaced by a space character (20h)		
e	longitude, the following characters are possible: 'E' east of Greenwich 'W' west of Greenwich		
ddmmyy	the current date:		
	dd	day of month	(01..31)
	mm	month	(01..12)
	yy	year of the century	(00..99)
a	magnetic variation		
hh	checksum (EXOR over all characters except '$' and '*')		
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

Format of the ABB SPA Time String

The ABB SPA Time String is a sequence of 32 ASCII characters starting with the characters ">900WD" and ending with the <CR> (Carriage Return) character. The format is:

>900WD:*yy-mm-tt_hh.mm;ss.fff*:*cc*<CR>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

yy-mm-tt	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
_	Space (ASCII code 20h)		
hh.mm;ss.fff	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	fff	milliseconds	(000..999)
cc	Check sum. EXCLUSIVE-OR result of the previous characters, displayed as a HEX byte (2 ASCII characters 0..9 or A..F)		
<CR>	Carriage Return, ASCII Code 0Dh		

Format of the Computime Time String

The Computime time string is a sequence of 24 ASCII characters starting with the T character and ending with the LF (line feed, ASCII Code 0Ah) character. The format is:

T:*yy*:*mm*:*dd*:*ww*:*hh*:*mm*:*ss*<CR><LF>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

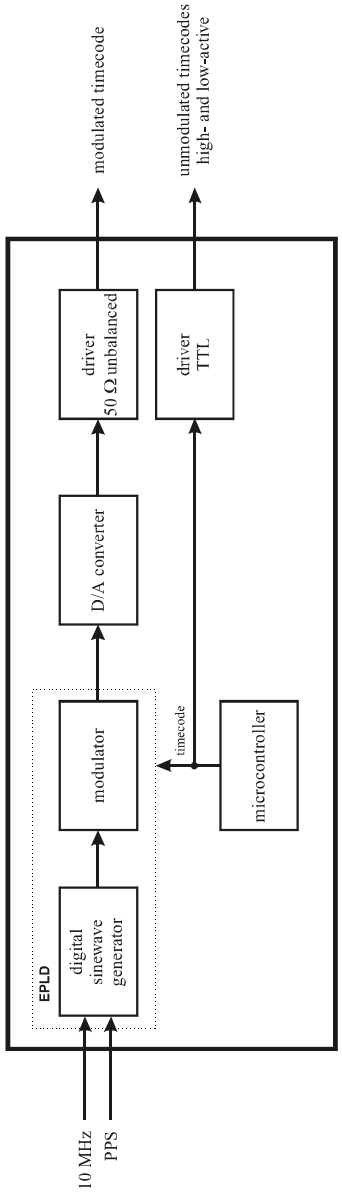
T	Start character sending with one bit occuracy at change of second		
yy:mm:dd	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
ww	the day of the week		(01..07, 01 = monday)
hh:mm:ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

Time code (optional)

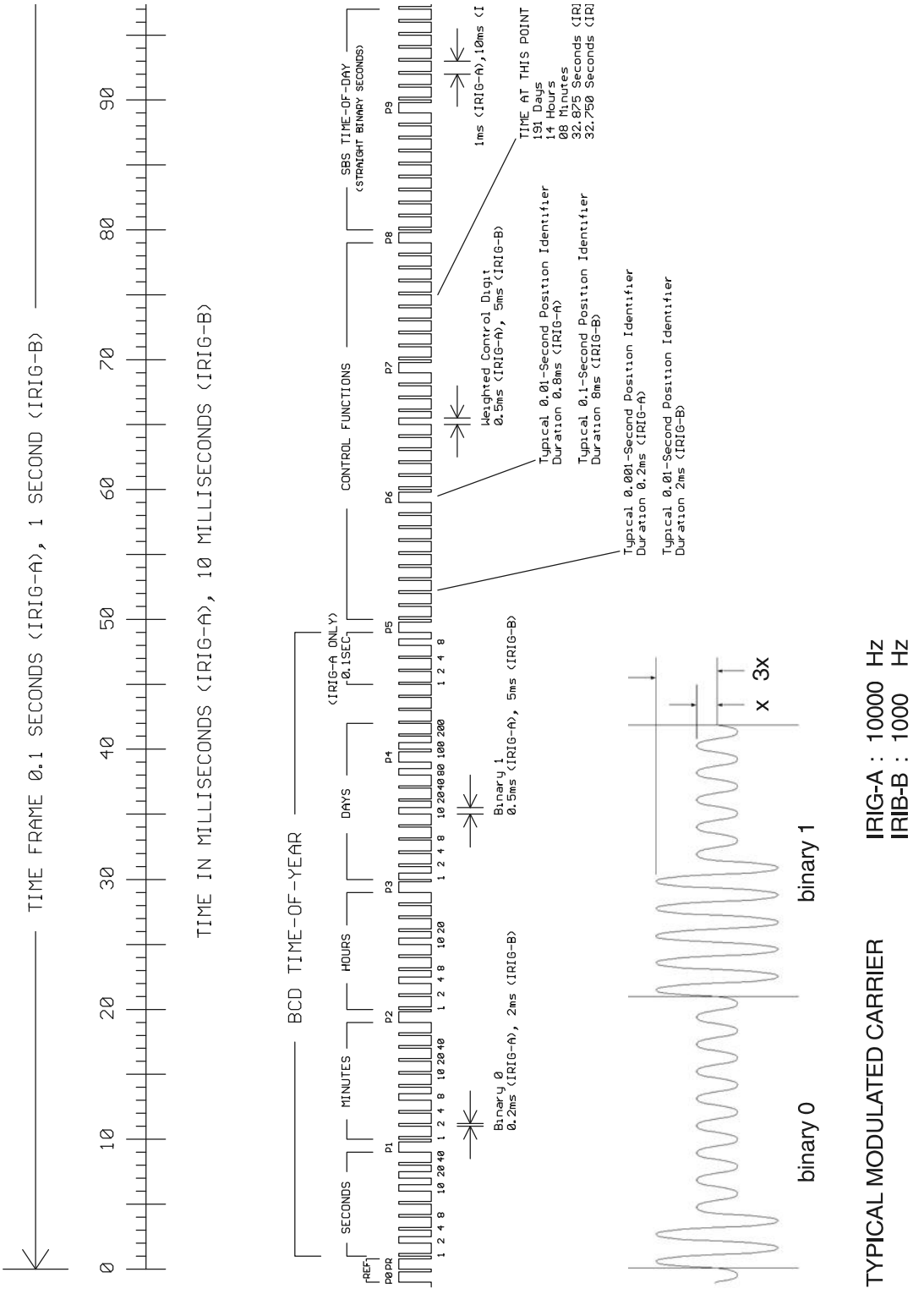
Principle of Operation

The Board GPS170 has been designed for the generation of IRIG, AFNOR and IEEE1344 standard time codes. Apart from the digitally generated amplitude-modulated code, it also provides the unmodulated DC-Level shift code. The modulated sine wave carrier and the board´s internal time pattern are derived from the radio clock´s disciplined oscillator.

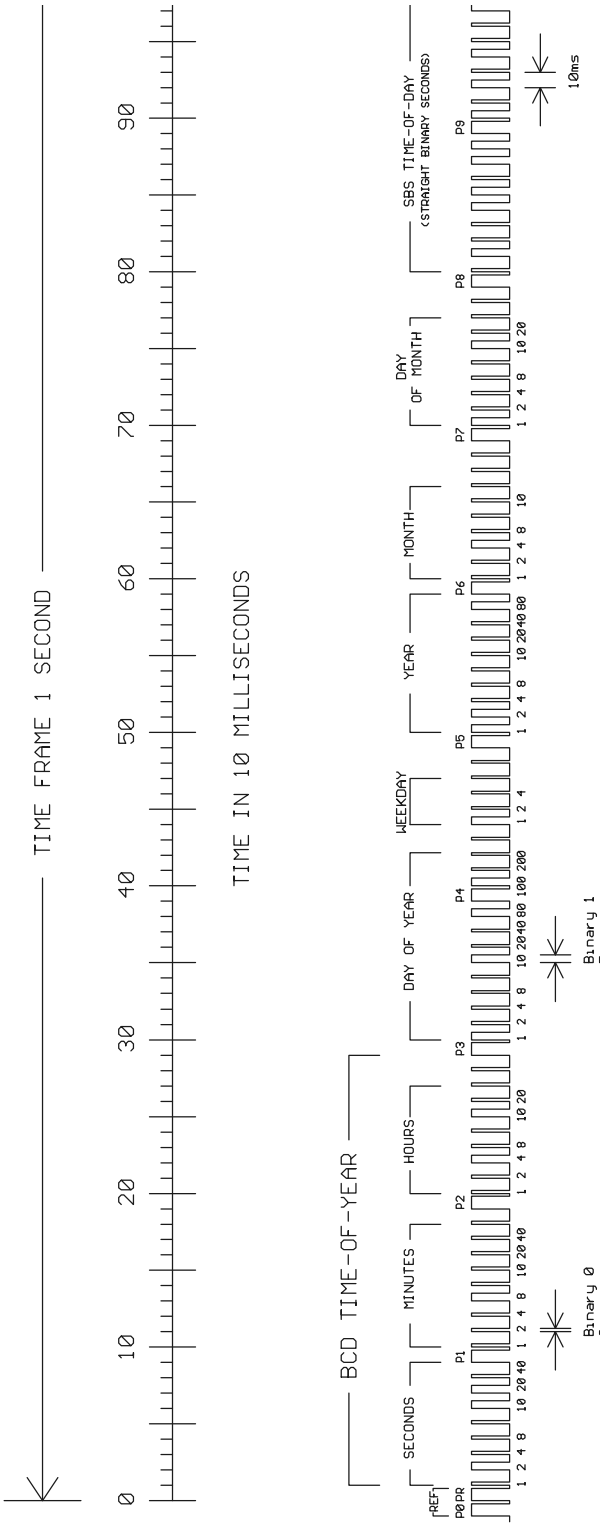
Block Diagram Time code



IRIG Standard Format



AFNOR Standard Format



Assignment of CF Segment in IEEE1344 mode

Bit No.	Designation	Description
49	Position Identifier P5	
50	Year BCD encoded 1	low nibble of BCD encoded year
51	Year BCD encoded 2	
52	Year BCD encoded 4	
53	Year BCD encoded 8	
54	empty, always zero	
55	Year BCD encoded 10	high nibble of BCD encoded year
56	Year BCD encoded 20	
57	Year BCD encoded 40	
58	Year BCD encoded 80	
59	Position Identifier P6	
60	LSP - Leap Second Pending	set up to 59s before LS insertion
61	LS - Leap Second	0 = add leap second, 1 = delete leap second [1.)]
62	DSP - Daylight Saving Pending	set up to 59s before daylight saving changeover
63	DST - Daylight Saving Time	set during daylight saving time
64	Timezone Offset Sign	sign of TZ offset 0 = '+', 1 = '-'
65	TZ Offset binary encoded 1	Offset from IRIG time to UTC time. Encoded IRIG time plus TZ Offset equals UTC at all times !
66	TZ Offset binary encoded 2	
67	TZ Offset binary encoded 4	
68	TZ Offset binary encoded 8	
69	Position Identifier P7	
70	TZ Offset 0.5 hour	set if additional half hour offset
71	TFOM Time figure of merit	time figure of merit represents approximated clock error. [2.)] 0x00 = clock locked 0x0F = clock failed
72	TFOM Time figure of merit	
73	TFOM Time figure of merit	
74	TFOM Time figure of merit	
75	PARITY	parity on all preceding bits incl. IRIG-B time

[1.)] current firmware does not support deletion of leap seconds

[2.)] TFOM is cleared, when clock is synchronized first after power up. *see chapter Selection of generated timecode*

Generated Time codes

Besides the amplitude modulated sine wave signal, the board also provides unmodulated DC-Level Shift TTL output in parallel. Thus six time codes are available.

a) B002: 100pps, PWM DC signal, no carrier
BCD time of year

b) B122: 100pps, AM sine wave signal, 1 kHz carrier frequency
BCD time of year

c) B003: 100pps, PWM DC signal, no carrier
BCD time of year, SBS time of day

d) B123: 100pps, AM sine wave signal, 1 kHz carrier frequency
BCD time of year, SBS time of day

e) B006: 100pps, PWM DC signal, no carrier
BCD time of year, year number (0...99)

f) B126: 100pps, AM sine wave signal, 1 kHz carrier frequency
BCD time of year, year number (0...99)

g) B007: 100pps, PWM DC signal, no carrier
BCD time of year, SBS time of day, year number (0...99)

h) B127: 100pps, AM sine wave signal, 1 kHz carrier frequency
BCD time of year, SBS time of day, year number (0...99)

i) AFNOR: Code according to NFS-87500, 100pps,
AM sine wave signal, 1kHz carrier frequency,
BCD time of year, complete date, SBS time-of-day,
Signal level according to NFS-87500

j) IEEE1344: Code according to IEEE1344-1995, 100pps,
AM sine wave signal, 1kHz carrier frequency,
BCD time-of-year, SBS time of day, IEEE1344
extensions for date, timezone, daylight-saving
and leap second in control functions (CF) segment.
see also table 'Assignment of CF segment in IEEE1344 mode'

Selection of Generated Time Code

The time code to be generated can be selected by Menu Setup IRIG Settings or the GPS Monitorprogram. DC-Level Shift Codes (PWM signal) B00x and modulated sine wave carrier B12x are always generated simultaneously. Both signals are provi-

ded at the VG64-Connector, i.e. if code B132 is selected also code B002 is available. This applies for the codes AFNOR NFS 87-500 and IEEE1344 as well.

The TFOM field in IEEE1344 code is set dependent on the 'already sync'ed' character ('#') which is sent in the serial time telegram. This character is set, whenever the preconnected clock was not able to synchronize after power up reset. The 'time figure of merit' (TFOM) field is set as follows.

Clock synchronized once after power up	:	TFOM = 0000
Clock <u>not</u> synchronized after power up	:	TFOM = 1111

For testing purposes the output of TFOM in IEEE1344 mode can be disabled. The segment is then set to all zeros.

Outputs

The module GPS170-TC provides modulated and unmodulated (DC-Level Shift) outputs. The format of the time codes is illustrated "IRIG-" and "AFNOR standardformat".

AM Sine Wave Output

The amplitude-modulated carrier is available at the VG connector pin 14a. The carrier frequency depends on the code and has a value of 1 kHz (IRIG-B). The signal amplitude is $3V_{pp}$ (MARK) and $1V_{pp}$ (SPACE) into 50 Ω. The encoding is made by the number of MARK amplitudes during ten carrier waves. The following agreements are valid:

a) binary "0"	:	2 MARK amplitudes, 8 SPACE amplitudes
b) binary "1"	:	5 MARK amplitudes, 5 SPACE amplitudes
c) position-identifier	:	8 MARK amplitudes, 2 SPACE amplitudes

PWM DC Output

The pulse width modulated DC signals labeled "IRIG" and "AFNOR standard format" are coexistent to the modulated output and is available at the VG connector pin 13a with TTL level.

Technical Data

Outputs: Unbalanced AM sine wave signal:
$3V_{PP}$ (MARK) / $1V_{PP}$ (SPACE) into 50Ω

PWM signal: TTL into 50Ω, active high

Signal Description GPS170

Name	Pin	Function
GND	32a+c	Ground
VCC in (+5V)	1a+c	+5V supply
VCC in (+12V)	2a+c	+12V supply
VCC in (+5V)	3a+c	+5 V supply (TCXO / OCXO)
P_SEC out	6c	Pulse when second changes, TTL level, active high, length 200 msec
P_MIN out	8c	Pulse when minute changes, TTL level, active high, length 200 msec
/RESET in/out	9c	RESET signal, Open Drain pulled up to +5V
Prog. Pulse out	10c-12c	programmable pulse, TTLlevel
100 kHz out	10a	100 kHz frequency output, TTL level
1 MHz out	11a	1 MHz frequency output, TTL level
10 MHz out	12a	10 MHz frequency output, TTL level
TIME CODE DC	13a	Time code unmod. out
TIME CODE AM	14a	Time code mod. out 3Vpp
DCF_MARK out	17c	DCF77 compatible second marks, TTL level active high, length 100/200 msec
TIME_SYN	19c	TTL output, HIGH level if synchronization has been achieved, LOW level after reset or in case of serious errors (e.g. antenna faulty)
F_SYNTH	21c	Synthesizer output, TTL-Pegel
F_SYNTH_OD	22c	Synthesizer output, Open Drain, max sink current to GND: 150mA
F_SYNTH_SIN	23c	Synthesizer output, sine-wave 1.5 V eff.
CAPx	27c, 28c	Time capture inputs (TTL), capture on falling slope
COMx TxD out		COMx RS-232 transmit data output
COMx RxD in		COMx RS-232 receive data input
SDA, SCL, SCL_EN		internal serial control bus, for extension boards
(reserved)		reserved, do not connect

Rear Connector Pin Assignments GPS170

	a	c
1	VCC in (+5V)	VCC in (+5V)
2	VCC in (+12V)	VCC in (+12V)
3	VDD in (TCXO/OCXO)	VDD in (TCXO/OCXO)
4	(reserved, FreqAdjust out)	
5	FIXED FREQUENCY out	(reserved in-3)
6	(reserved in-1)	PPS out
7	(reserved in-2)	
8	(reserved, 10 MHz_OSC in)	PPM out
9	10 MHz SINE out (OCXO MQ/HQ)	/RESET in/out
10	100 kHz out	ProgPulse0 out
11	1 MHz out	ProgPulse1 out
12	10 MHz out	ProgPulse2 out
13	TIME CODE DC out	
14	TIME CODE AM out	
15	COM2 RxD in	
16	COM2 TxD out	(reserved, P7.5)
17	COM3 RxD in	DCF_MARK out
18	COM3 TxD out	(reserved, Vref/TxD2 TTL)
19	GND	TIME_SYN out
20	GND	(reserved, P7.6)
21	GND	F_SYNTH out
22	GND	F_SYNTH_OD out
23	GND	F_SYNTH_SIN out
24	GND	COM1 TxD out
25	GND	
26	GND	COM0 TxD out
27	GND	CAP1 in
28	GND	CAP0 in
29	GND	COM1 RxD in
30	GND	COM0 RxD in
31	GND	GND
32	GND	GND
	NEW SIGNALS compared to GPS167 (reserved, not imlemented yet)	

male connector according to DIN 41612, type C 64, rows a + c

The GPSMON32 Configuration and Monitoring Application

The program GPSMON32 can be used to monitor and configure all essential functions of Meinberg GPS-Receivers. The Software is executable under Win9x, Win2000, WinXP and WinNT. To install GPSMON32 just run Setup.exe from the included diskette and follow the instructions of the setup program. The current version can be downloaded from the Meinberg website (www.meinberg.de).

GPSMON32 and the clock can communicate either via serial link or via TCP/IP connection if the clock comes with a network interface (LANXPT or SCU-XPT module). The mode to be used can be selected in menu ‚Connection->Settings' by selecting either serial or network.

Serial Connection

To obtain a connection between your PC and the GPS-receiver, connect the receivers COM0 port to a free serial port of your PC. The PCs comport used by the program GPSMON32 can be selected in submenu **'PC-Comport'** of the **'Connection'** menu.

Additionally, transfer rate and framing used by the program are selectable within this menu. Communication between the clock and the PC is possible only if the GPS serial port is configured in the same way as the PCs comport. Optionally you can enforce an access, if the GPS serial port is not configured with appropriate parameters for communication. Select the menu item '**Enforce Connection**' in menu **'Connection'** and click **'Start'** in the appearing window. Some firmware versions of GPS170 do not support this way of setting up a connection. If '**Enforce Connection**' doesn't succeed apparently, please change the serial port parameter of GPS COM0 manually to the corresponding values you used for the serial port of your PC.

Network Connection

Settings needed for a network connection can be done in menu ‚Connection->Settings'.

To initiate a network connection from within GPSMON32, the mode ‚network' must be selected. Furthermore the TCP/IP address of your LANXPT/SCUXPT-Module has to be entered in field ‚IP-Address'. If the IP-Address is unknown, you can let the program query your network for available clocks by clicking the ‚Find' button. A new connection can be set up by selecting to one of the found addresses (point and click). Network access to Meinberg radioclocks is always password protected, the default password is "Meinberg" (without quotes).

The Online Help function of GPSMON32 (F1) provides detailed information on setting up a TCP/IP connection.

Online Help

The online help can be started by clicking the menu item 'Help' in menu Help. A direct access to a related help topic can be obtained everywhere by pressing the F1 key. The help language can be selected by clicking the menu items Deutsch/Englisch in the Help Menu.